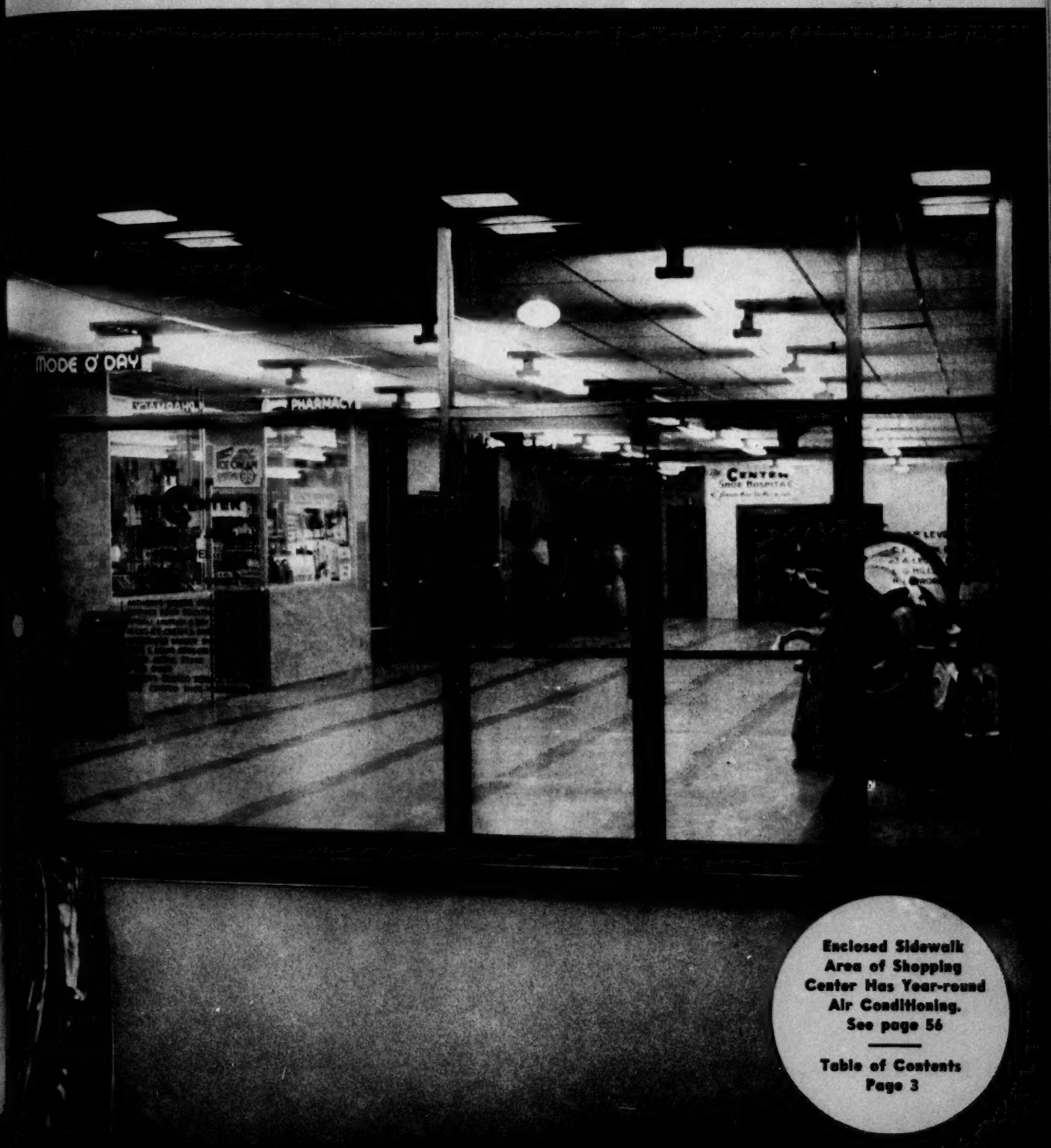
AIR CONDITIONING HEATING AND VENTILATING

JULY, 1957—54th Year



Enclosed Sidewalk Area of Shopping Center Has Year-round Air Conditioning.
See page 56

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to Insure...Your Reputation

the Best SAFETY VALVES and CONTROLS

WATTS LAWRENCE MASS. U.S.A.

Your skill plus the use of QUALITY PRODUCTS have built an outstanding reputation for the Plumbing and Heating industry.

Protect this reputation by installing Watts plumbing and heating safety valves and controls since nothing can compete with WATTS QUALITY. Remember, the satisfied customer is *your* future customer.

A COMBINED TEMPERATURE-PRESSURE and PLAIN TEMPERATURE RELIEF VALVES (52 Models) — ASME rated and AGA listed types — Sizes ½" to 2". BTU/HR ratings from 125,000 up to 3,000,000 Fully Automatic and Fuse Plug types; also Calibrated types.

B WATER PRESSURE REDUCING VALVES (42 Models) — Sizes ⅛" to 4". With integral strainers or large volume models with or without a strainer.

C VACUUM RELIEF VALVE — Listed by AGA — Sizes ½" or ¾".

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F BOILER WATER LEVEL CONTROLS (16 Models) — Listed by U. L.

LOW WATER CUT-OFFS: Gauge glass and built-in types, max. steam pressure 25 lbs. Heavier construction type, max. steam pressure 50 lbs.

BOILER WATER FEEDERS and FEEDER and CUT-OFF COMBINATIONS: Gauge glass type, max. steam pressure 25 lbs. Heavier construction types, max. steam pressure 35–75 lbs.

G HOT WATER HEATING SPECIALTIES (18 Models).

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PACKAGED UNITS: ASME listed pressure relief valves and feed water pressure regulators. Sizes ½" to 1". System capacities up to 12,500 sq. ft. rad. Nos. FR1 through 7 for ordering convenience.

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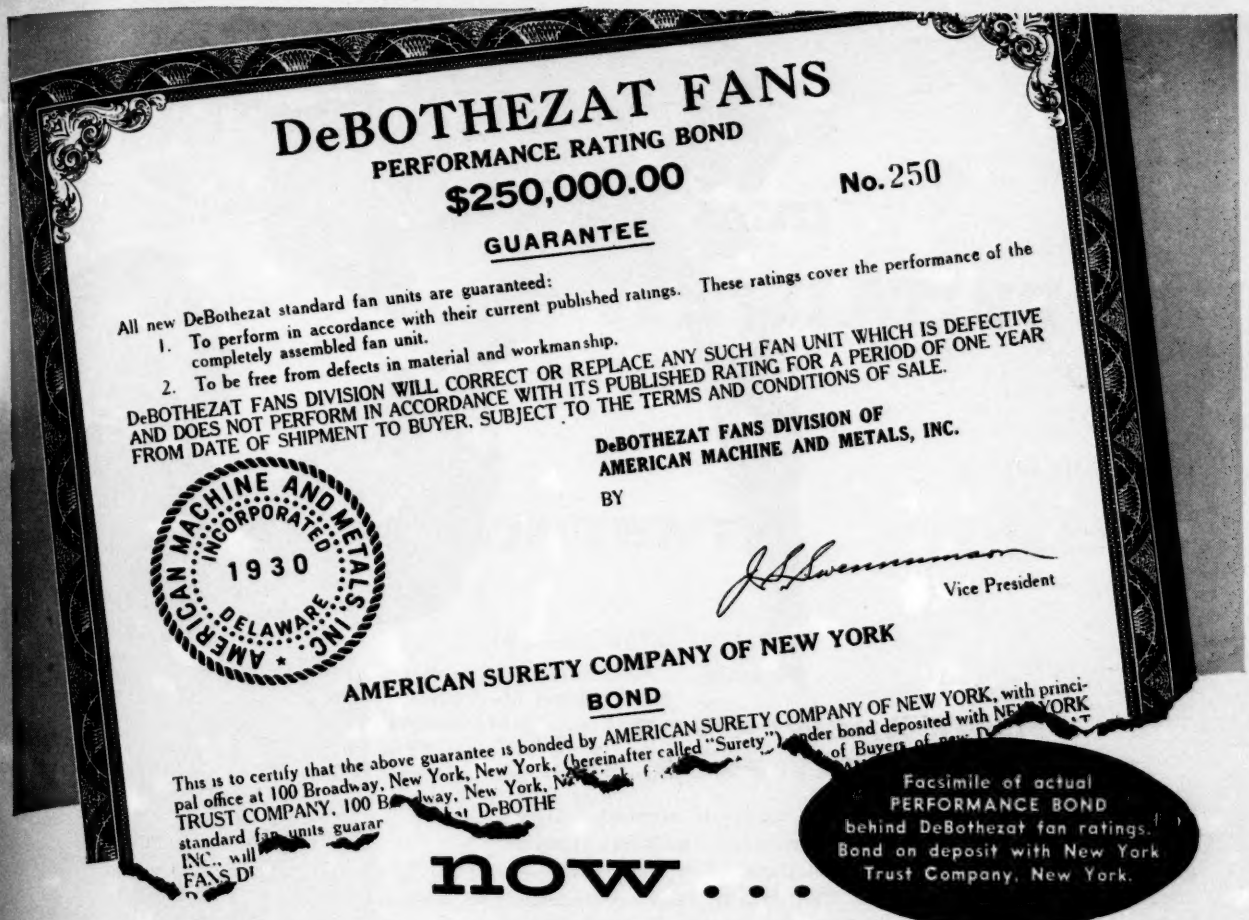
WATTS REGULATOR COMPANY
Lawrence, Massachusetts



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DeBOTHEZAT FANS DIVISION OF
AMERICAN MACHINE AND METALS, INC.

BY

Vice President

AMERICAN MACHINE AND METALS, INC. INCORPORATED 1930 DELAWARE

AMERICAN SURETY COMPANY OF NEW YORK

BOND

This is to certify that the above guarantee is bonded by AMERICAN SURETY COMPANY OF NEW YORK, with principal office at 100 Broadway, New York, New York, (hereinafter called "Surety") under bond deposited with NEW YORK TRUST COMPANY, 100 Broadway, New York, New York, for the benefit of Buyers of new DeBOTHEZAT standard fan units guaranteed by DeBothezat Fans Division of American Machine and Metals, Inc., will FANS DI

Facsimile of actual PERFORMANCE BOND behind DeBothezat fan ratings. Bond on deposit with New York Trust Company, New York.

now . . . Bonded Fan Ratings

You can depend upon all DeBothezat fan ratings because they are *bonded*. When you select a DeBothezat fan by its published rating, do so with confidence. No guesswork — no allowance to be on the safe side.

All DeBothezat fan performance ratings are *bonded* by the American Surety Company and this bond is on deposit with New York Trust Company, New York.

This is your positive assurance that a DeBothezat rating is what the *complete* fan unit actually puts out.

Remember, you can depend on DeBothezat fan ratings because they're BONDED.

Partial view of DeBothezat's own advanced testing facilities. Accurate wind tunnel tests are made here in accordance with the appropriate NAFM plate . . . conform to U. S. Dept. of Commerce Standard 178-51.

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A DIVISION OF

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Your Warren Webster Man holds the answer to comfort heating in problem areas . . . in factories, warehouses, hangars, garages, machine shops. It's the Webster Giant Blower Fan Unit Heater — largest member of the Webster Unit Heater family — and it's backed by Webster's Finest Product, the Warren Webster Man.

Here's uniform, economical, versatile heating and/or ventilating . . . and complete flexibility in size, arrangement and control. Nine sizes, each with one of ten heating elements for steam or hot water, assure exactly the right unit for every need. Up to 28,000 c.f.m. of heated air, at relatively low final temperatures, are discharged at velocities up to 3400 f.p.m. for rapid diffusion, reduced stratification. Mounting may be floor, horizontal-suspended, wall, or inverted. Ask your Warren Webster Man for Bulletin W-135. Or write us.

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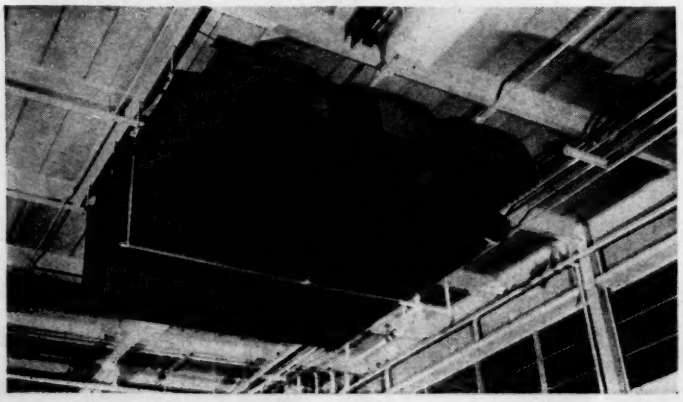

Webster's Finest Product . . . the Warren Webster Man

WARREN WEBSTER

HEATING . . . COOLING

AIR CONDITIONING HEATING AND VENTILATING

JULY, 1957

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The Cover: Three-level shopping center in Omaha, Neb., has indoor sidewalks. Heated during winter, these zones are cooled in summer.

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HIGH SPOTS

• Retailers of **room air conditioners** felt wonderful as hordes of heat-wave weary customers over the nation beat a path to their doors for the best selling spree of the year. A poll conducted by Carrier Corporation during the June heat wave revealed that in Washington, D. C., for instance, as many units were sold in three days as in the previous three weeks. Central residential sales likewise boomed.

• Following the pattern established by Housing and Home Finance Agency with its first Women's Congress on Housing, a group of national trade associations is planning to invite homemakers from all over the country to discuss the **human side of housing** in Washington this November, BRI reports. Associations participating in the organization of the conference are: Better Heating-Cooling Council, Portland Cement Assn., National Lumber Manufacturers Assn., Copper and Brass Research Assn., and National Assn. of Plumbing Contractors. It is planned that technical experts, producers, builders and architects will team up with home economics experts and psychologists to discuss with the housewives how the basic components of good housing contribute to a stable budget and long-term family security.

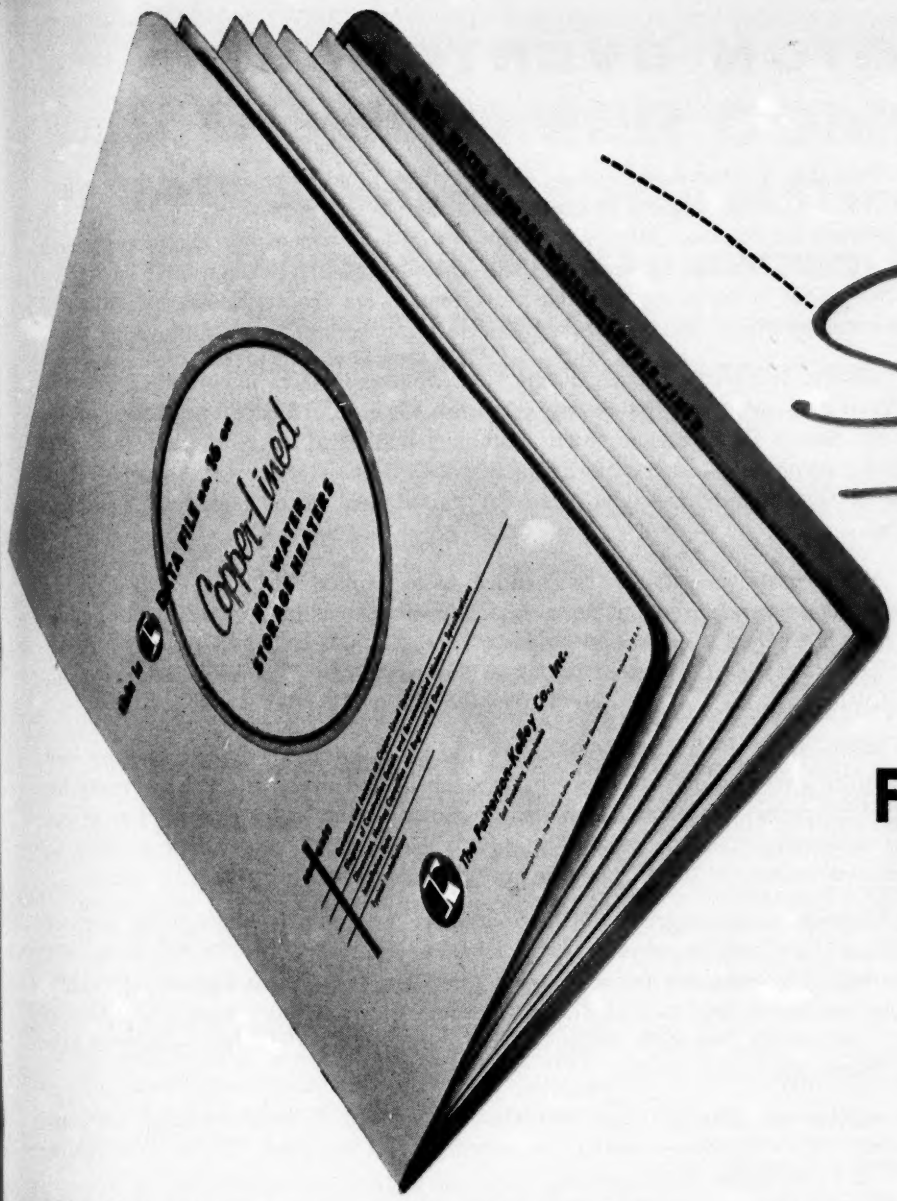
• **First pipeline** ever built to transport solid materials over mountainous country has gone into operation. It carries a mixture of **crushed Gilsonite ore and water** 72 miles from the mines of American Gilsonite Co., at Bonanza, Utah, to company's refinery near Grand Junction, Colo., where it is converted into coke and gasoline.

• That science relating to hydraulic-electrical combinations, as applied in hot water heating and chilled water cooling, as well as in snow melting and faucet water heating, should be called **hydronics,** the Institute of Boiler and Radiator Manufacturers proposes to the industry. The English professors say "yes". See News of the Month, page 114.

• As an aid to exhibitors who wish to do market research, study copy themes for advertising, and get consumer reactions to new models, the **Air Conditioning & Refrigeration Exposition** will, for the first time, open its doors to the general public. The biennial show is sponsored by Air Conditioning and Refrigeration Institute, Washington, D. C. and the forthcoming November 18-21 affair will be the 10th, held at the International Amphitheatre, Chicago. The essential trade character of the show will be maintained by restricting admission on the first three days.

• Retailers of downtown Westwood, N. J., are contemplating the enclosure of an entire street and conversion of that street into an **air-conditioned mall,** two sidewalks high, in order to compete with mushrooming suburban shopping centers around them. See News of the Month, page 114.

• John C. Haroldson, Duluth Steam Corp., Duluth, Minn., was elected president of **The National District Heating Association** at the 48th annual meeting of the association held at The Homestead, Hot Springs, Va., June 3 to 6. This group consists of utility companies who supply steam through a system of underground pipes for space heating in buildings. Other officers elected at this convention include: William G. Gillim, Consolidated Edison Co. of New York, Inc., New York, N. Y., 1st vice president; George F. Prestwich, Philadelphia Electric Co., Philadelphia, Pa., 2nd vice president; Albert F. Metzger, Allegheny County Steam Heating Co., Pittsburgh, Pa., 3rd vice president. John F. Collins, Jr., was re-elected secretary-treasurer and his headquarters continue at 827 N. Euclid Ave., Pittsburgh, Pa.



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With the increasing trend to copper-lined water heaters for rust-free water and low maintenance, P-K has compiled for you complete data on this type of heater. Complete specification outline, construction details, heating capacities, engineering and installation data, plus many other needed facts are all contained in this compact, concise, easy-to-use file. A copy is yours for the asking. . . . Mail the coupon today. The Patterson-Kelley Co., Inc., 107 Burson Street, East Stroudsburg, Pa.

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City_____ Zone_____ State_____

WASHINGTON OVERTONES

by LORING F. OVERMAN

● Principal overtones of Capitol Hill actions as fiscal '57 merged on July 1 into FY 1958 were the jingling of countless coins.

Billions for defense. Billions for operation of government bureaus, departments and agencies. Billions for controversial projects—schools, housing, highways.

Not at all in harmony with these overtones were the continuing pressures of the economy block, urging a brake on all future government expenditures.

● Money, and credit, moved during June from economics into politics.

Transition came with the opening of an **investigation of Federal financial policies** by the Senate Finance Committee. Although publicized as a full-scale investigation of all phases of government money policies, observers see the hearings as a showdown between tight-money and easy-money exponents in opposing political corners.

● Administration's witnesses will endeavor to explain why tight-credit policies slowed housing construction but avoided dangerous inflation; braked automobile buying, but halted overbuying.

Democratic side is expected to dangle the easy-credit promise as a lure to off-year voters.

● Members of the air-conditioning, heating and ventilating industries may well watch the investigation with concern. It is considered likely to set the keynote for the 1958 elections. Having seen how curtailed credit, among other things, can slow a housing program, readers of this publication will have much at stake as testimony brings out the fact and fiction of managed finance.

● Meanwhile, the sluggish housing market is beginning to show some signs of reviving. New housing starts in May reached an annual rate of 990,000, seasonally adjusted. This was five percent higher than April's 940,000 annual rate; 12% above the March low rate of 880,000. Actual starts in May were 102,000—up 11% over April, but 10% below May of 1956. The 1957 May figure was also the lowest May since 1951.

● Applications for mortgage insurance under the Federal Housing program reached 16,900 in May—highest level since May of last year. During that month, 22,132 applications were received.

Actual housing starts during May under FHA program totaled 15,000—15% of the total starts during the month.

FHA officials believe the May upturn **signals an end to the downward trend** in home construction.

Conclusion is borne out by increasing number of applications for mortgage insurance on completed homes. May applications numbered 25,500—highest since May of last year, when 26,080 applications were received.

Interest in both new and completed housing indicates a lively public interest in buying shelter, FHA folks point out.

● That it takes more than "authorizations" to actually construct low-cost public housing now seems assured.

Speaking in Washington before the National Housing Conference, FHA Administrator Cole said his office is studying the possibility that **private industry may have to come forward** with ideas for low-income housing.

Mr. Cole said that Congress cannot solve the low-cost housing problem merely by writing larger figures into public housing legislation. He pointed out that of the 35,000 units of public housing authorized for federal assistance in fiscal 1957, fewer than 2,000 had been started.

(Concluded on page 8)

FOR SUMMER COMFORT,

the U. S. National Bureau of Standards rates multiple layers of aluminum FIRST

among all insulations it tested, as reported in its booklet, "Effect of Ceiling Insulation upon Summer Comfort," BMS52. (You can get it at our expense.)

To be comfortable in summer you must ward off unwanted heat rays or radiation. Most heat flow thru a *roof space* in summer is by radiation. There is no convection down, and little conduction thru low density air.

Temperatures can reach over 140° F. in some attics. With an absorptivity for heat rays of only 3%, reflectivity 97%, and emissivity 3%, scientific multiple aluminum is an effective shield against summer heat. The slight mass of its components, air being preponderant, makes it very low in heat storage.

COST OF AIR-CONDITIONING REDUCED

This shield against radiant heat lifts part of the load from house-cooling equipment, reducing installation and up-keep costs. But the building which is *not* artificially cooled, needs this shield even more!

Multiple aluminum is also markedly effective against radiation through a *wall space.*

Air of higher outside temperatures will support more vapor than the cooler air inside a building. Often vapor flows from the outside to the inside of the house, obedient to the law of physics that vapor travels from areas of greater density to areas of less vapor density.

Multiple aluminum has long, continuous metallic sheets on *both* sides which are almost impervious to water vapor. Infiltration under the flat, stapled flanges is slight. The scientific construction of multiple layers of aluminum, fiber and air spaces, minimizes condensation formation on or within this type of insulation. Timber rot, crumbling plaster, peeling paint, etc. are minimized.

CAUTION: *We do not recommend placing vapor barriers on both sides of all insulations.*

IN WINTER, NEED FOR INFRA EVEN GREATER

The low conductivity, the slight heat ray absorptivity and emissivity of scientific multiple aluminum, and the retarding of inner and outer convection by the multiple layers of metal and fiber, amazingly effective in summer, assume paramount importance in winter when this 3-fold bar to outward heat flow cuts fuel bills and increases comfort.

To obtain MAXIMUM, **uniform-depth** protection against heat loss and condensation formation, it is necessary to use the new **edge-to-edge** multiple aluminum , **each** sheet of which stretches from joist to joist.

THERMAL VALUES
Infra Type 4 Parallel Insulation

Down-Heat C .042*=7⅞" non-metallic insulation†
Up-Heat C .105*=3⅛" non-metallic insulation†
Wall-Heat C .068*=4¾" non-metallic insulation†

Cost installed between wood joists, material and labor, about 8¢ sq. ft.

Type 6 also available

Can be purchased everywhere through your preferred local dealer.

*Determined by method of National Bureau of Standards in H.H.F.A. Research Paper 32.
†Calculated on basis of limiting thermal values cited in Fed. Specs. LLL-f-321b; HH-I-585; HH-I-521c; HH-I-551a.

Infra Insulation Inc., 525 Bway., N. Y., N. Y. Dept. V-7
Send "Moisture Condensation in Buildings."

NAME_____

FIRM_____

KIND OF BUSINESS_____

ADDRESS_____

WASHINGTON OVERTONES *(Concluded from page 6)*

Under consideration, he said, are plans for rehabilitation of existing housing, construction of more cooperative type housing, and methods to permit low-income families to shift from renting to ownership.

"Private industry," said Mr. Cole, "must accept responsibility in this field and demonstrate its willingness as well as its ability to serve some of this need; public housing officials must be willing to alter patterns that were established 20 years ago and make them apply to the broader problems we face today."

● During the mid-June heat wave, Washington's electrical planners were given a revealing look at the role of air conditioning in modern living.

In New York, Chicago, and several other principal Eastern cities, **electrical capacity was overtaxed** by heavy and sustained demands for commercial industrial and domestic air-conditioning and refrigeration.

With air conditioning just coming into its own in many areas of commercial and residential life, power folks in Washington indicate that a new yardstick may be required if future requirements are to be estimated accurately.

● Recent emergencies in the electric power field may add fuel to the glowing flame of competition between gas and electric interests vying for the nation's heating and cooling business.

Recently, Air Force construction plans have pulled military officialdom into some of the controversies. In one instance, some **1,500 electrically-operated heat pumps were ordered by Air Force** to heat and cool housing at an Arkansas air base. Gas interests felt keenly their failure to have gas heating-cooling specified.

Electric folks regard the heat pump as a means of sharing the winter heating market, and thereby leveling off year-round demands for power.

Gas producers, conversely, would like a share of the summer cooling assignment, ideal at a time when gas demand is off as much as 90%.

Both are working hard to sell the military, hoping to have a big-operation success story to tell to civilian domestic and commercial prospects.

● Eyeing August 15 as target date for adjournment, members of the 85th Congress are beginning to wonder how they can move in weeks a log jam of legislation accumulated since the present session opened in January.

With appropriations dating from July 1 out of the way, however, action on many measures can be surprisingly rapid. Those who are either for or against pending legislation will find the coming weeks the ones to watch.

● Legislation continuing Small Business Administration as a permanent agency is still in the "uncertain" stage.

Administration has urged Congress to give earnest consideration to five measures which would implement money-saving recommendations of the Hoover Commission on Organization of the Executive Branch.

Amendments to legislation authorizing 41,000-mile interstate highway system have alarming implications. Included are proposals to add 7,000 miles to the system—raising costs by $15 billion and extending payment period by seven years.

Interest of the states in expanding the program is due to fact that federal government pays 90% of cost of highways included in the interstate program; only 50% of regular federal aid highways. Having a road declared a part of the interstate system gives the state a road at 10 cents on the dollar.

● With programs increasing in size, and in cost, **hopes for federal income tax reductions seem more and more remote.** Economy-minded groups, including U. S. Chamber of Commerce and National Association of Manufacturers, keep urging voters to caution legislators not to let expenditures get out of hand. Nationwide movement for economy—noted in Washington earlier in the current session of Congress—appears to have quieted down. Indications are that big government, big programs, and big taxes are here to stay.

To keep corrosion from "calling collect"—
Pacific Telephone & Telegraph Company used Wrought Iron Pipe

This radiant heating system, serving 22,500 square feet of floor area in Pacific Telephone & Telegraph Company's new warehouse at San Leandro, California, is an excellent example of the Company's insistence on durability. More than 16,300 feet of corrosion-resistant wrought iron pipe was used to safeguard the system against premature failure and costly repair.

The system, planned and designed by PT&T's Engineering Department, features some interesting construction details employed to protect the floor against damage from heavy fork-lift trucks and impact caused by bouncing reels of cable. After the 10-inch structural slab was poured, wrought iron pipe coils were laid in place. Over the pipe coils, a wire mesh was stretched to strengthen the concrete "topping" slab, and contribute to more even heat distribution. Then the pipe and mesh were covered with 3 inches of concrete. A metallic floor hardener was applied to the surface.

Architects for the project were Thomsen & Wilson, San Francisco. The system was designed by Harry S. Haley, San Francisco Consulting Engineer, in collaboration with Pacific Telephone & Telegraph Company engineers. The installation was made by Scott Co., Bay Area Mechanical Contractors.

Wrought iron pipe is ideally suited for this service because of its ease of installation, dependability in service. It takes short radius bends, without spring-back. It produces sound welds, free from pin-hole leaks. Its uniform structure assures sharp, full-depth threads. And because of its mechanical strength, wrought iron pipe withstands damage during installation. In service, wrought iron stays on the job longer, costs less per year.

Our bulletin, *Wrought Iron Pipe for Radiant Heating*, gives complete details, documents service records. Write for a copy.

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Available throughout the world

BYERS Wrought Iron Tubular and Hot Rolled Products

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

BRIEFLY STATED

• **Among the Engineers—Harry Terry and Associates,** consulting engineers, are in new offices at 156 West State St., Trenton, N.J. Formerly in New York City, the firm specializes in air conditioning, heating, ventilating, illumination, electric wiring, plumbing, sanitary engineering, and allied engineering work for architects . . . The **Heyward-Robinson Company** moved to The Engineering Building, 114 Liberty St., New York City, and announced that in addition to its specialization in the industrial plant and building design, it has enlarged its activities to include construction as well.

• An urgent **need exists for engineers** experienced in waterways construction to plan, coordinate, and inspect the construction of flood control projects at Waterbury, East Barre, and Wrightsville, Vt. The **U.S. Army Engineer District,** New York, asks that interested parties contact Area Engineer, U.S. Army Engineer District Field Office, Plattsburgh Air Force Base, Plattsburgh, N.Y. Federal Civil Service positions start from $3175, for engineering aids, to $7035 for engineers. Mechanical engineers (heating ventilating, refrigeration, air-conditioning), will perform "periodic and special field investigations and inspections for adherence to plans and specifications for construction and installation of mechanical equipment such as pressure steam boilers, steam distribution systems, sprinkler systems, air conditioning, refrigeration, plumbing, gas distribution, etc."

• **With the Societies and Institutes—** Joint authorship of a paper entitled "Temperature Changes in Refrigerated Rooms During Pull Down Period", published in *Refrigerating Engineering,* won Dr. Tamami Kusuda, Worthington staff engineer, and Prof. James L. Threlkeld, University of Minnesota, the Wolverine Award of the **American Society of Refrigerating Engineers** at the Society's annual meeting in Miami last month . . . The 53'rd local section of the **National Association of Corrosion Engineers** is located at Bakersfield, Calif. Four regional meetings of the Association are scheduled for the fall, which will include technical symposia, committee meetings, two regional product exhibitions, and many social events . . .

James M. McGrath, a member of California State Polytechnic College's Air Conditioning & Refrigeration Engineering faculty, has been appointed a member of International Educational and Examining Board, **Refrigeration Service Engineers Society.** He will assist in formulating and reviewing the examinations by which, at 6-month intervals, RSES conducts examinations for student, associate, active, and certificate members . . . The following were elected officers of **Fluid Controls Institute,** Inc., at its Spring meeting in White Sulphur Springs, W. Va.: president, John S. Leslie, Leslie Co.; vice-president, Dean E. Madden, A. W. Cash Valve Mfg. Corp; vice-president, Marshall B. Taft, Minneapolis-Honeywell Valve Div; treasurer, Paul K. Rogers Jr., Skinner Chuck Co; secretary, Edward J. Glinske Jr., Cochrane Corp; and chairman of the board of directors, John C. Koch, Conoflow Corp., former president of the Institute . . .

W. Rutter, chief engineer, Burt Mfg. Co., Akron, Ohio, was named chairman of the Power Roof Ventilating Division of **Air Moving and Conditioning Association,** Detroit. He had been vice-chairman . . .

More than 300 **Building Research Institute** members, guests, and wives gathered in Chicago for the BRI 6th Annual Meeting in mid-April for what was termed its most outstanding technical program to date. A full calendar of social events was climaxed by the Annual Dinner. Full proceedings will *not* be duplicated. A digested report will be sent to each member and to each person registered at the meeting. December 4-5 is set as the official date for BRI Research Correlation Conference on *Adhesives and Sealants in Building,* Shoreham Hotel, Washington, D.C. . . . Designed by Minoru Yamasaki of Royal Oak, Mich., the new **American Concrete Institute** building in Detroit now under construction will have a thin-shell concrete roof, cantilevered 19 ft front and rear from monolithic concrete corridor walls . . .

New president of **Mechanical Contractors Association of America** is Joseph H. Spitzley, president of R. L. Spitzley Heating Co., Detroit. During the coming year of his incumbency he will travel a good deal, speaking in behalf of expanding the organization's activities in the United States and Canada.

• **New Sales Representatives —** Glassner Equipment Co., Pittsburgh, Pa., is appointed sales representative for **Buensod-Stacey.** It will provide equipment and technical services for engineers, architects, and contractors planning dual-duct installations . . . Establishment of a branch sales engineering office in Miami and appointment of W. G. Harward as branch manager is announced by **American Blower** Div., American-Standard . . . The Blake Thomas Co., a new firm in Effingham, Ill., and Boyd Engineering Co., in West Texas, N. Mex., will distribute air-conditioning and refrigeration products for **Recold.** . . . **Marlo Coil** Co.'s new representative in Beloit, Wis., is Dales Weitman & Co. . .

As an authorized source, Florida Weathermakers, Inc., Jacksonville, will handle **Trane** Co.'s package air conditioning equipment line . . . Service Parts Co., Melrose Park, Ill., are new wholesale distributors of Hydraline Products of Borg-Warner's **York** Division. Items include central system water chillers, remote air conditioners and refrigeration units for residential and commercial buildings . . . Hammond Brass Works announces appointment of Eugene Zaleski as industrial sales representative for the Great Lakes region.

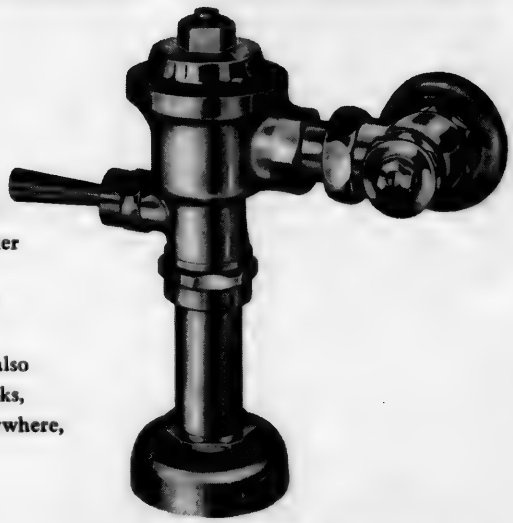
• **Under Another Hat—**Benjamin F. Van Wormer, **American Radiator and Standard Sanitary** Corp. comptroller, has been elected to membership in the Controllers Institute of America, a non-profit organization of controllers and finance officers from all lines of business . . . Henry L. Shuldener, president of **Water Service Laboratories,** Inc., has been elected chairman of the New York Chamber of Commerce committee on health and welfare. The committee conducts studies and issues reports on such subjects as air and water pollution, fluoridination of water supplies, and juvenile delinquency.

(Concluded on page 12)

And in Atlanta — A FUTURE OF FAULTLESS SERVICE

PEACHTREE-BAKER BUILDING
Atlanta, Georgia
BUILDINGS INVESTMENTS, INC., MASSELL ENTERPRISES
owner
ALEXANDER & ROTHSCHILD
architects
ART PLUMBING COMPANY
plumbing contractor
COWAN SUPPLY COMPANY
wholesale distributor
AMERICAN RADIATOR & STANDARD SANITARY CORP.
plumbing fixtures manufacturer

On a gentle slope off Peachtree Street, famed commercial center of Atlanta, stands this gleaming COYNE & DELANY installation . . . first completed element of the proposed Peachtree-Baker Center. A landscaped city block will eventually include a hotel and a merchandise mart, all in a relaxed and pleasant atmosphere. Featuring solid walls of glazed white brick and curtain walls of glass, aluminum, and porcelain enameled steel panels, the Peachtree-Baker Building also provides pedestrians with weather protected colonnades and red brick walks, reminiscent of old Atlanta. For buildings with a future, here and everywhere, careful long range planning calls increasingly for DELANY — "the fastest growing name in flush valves!"



This new "HAND BOOK and CATALOG No. 53" is the most comprehensive of its kind—designed for everyday reference . . . 19 pages of installation details for exposed, concealed and special FLUSH VALVE installations . . . over 75 blue prints . . . cut away views . . . many pages of charts, formulae, piping details . . . sent free, if requested on firm letterhead.

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK
IN CANADA: THE JAMES ROBERTSON CO., LTD.

DELANY *Flush* **VALVES**
Since 1879

BRIEFLY STATED

(Concluded from page 10)

• **Up on Top**—The **Dunkirk Radiator** Corp. announces election of M. C. Reed as president of the company succeeding the late L. N. Murray. Mr. Reed was vice-president in charge of sales . . . **Robertshaw-Fulton Controls** Co.'s new prexy is Thomas T. Arden. John A. Robertshaw, former president, becomes chairman of the board. Mr. Arden had been in charge of the company's western operations, including two manufacturing divisions and a research center now nearing completion . . . Elected president of **Marsh Valve** Co., is Peter P. Balnis. He and Samuel J. Childs recently purchased the Dunkirk firm which has been actively engaged in the production of hot water and steam valves since 1910 . . . Robert H. Morse heads the list of 15 officers elected by the board of **Fairbanks, Morse & Co.** with his designation as president and chief executive officer. Gorden R. Anderson is vice-president, engineering; F. M. Mason Jr., vice-president, government business; Robert Dana Brown, secretary and asst. treasurer; and R. E. Whitely, asst. secretary.

• **Among the Manufacturers' Personnel**—Announcement of several elections was made by **Dunham-Bush,** Inc., West Hartford, Conn. A. G. Zumbrun Sr. is a new vice-president and director; G. C. Mumford, assistant treasurer; and S. W. Mozley, member of the board of directors. Messrs. Zumbrun and Mumford will serve as top management of Brunner Division, recently acquired wholly owned subsidiary. For its other wholly-owned subsidiary, The Brunner Co., Gainesville, Ga., Kenneth Gair is now vice-president and assistant general manager. Edward Albin will do the sales engineering for the company in the St. Louis area . . .

Richard (Dick) Schiewetz is general manager of **Trane** Co.'s new Clarksville, Tenn., plant, and Robert P. Marshall has been named factory superintendent. Central type residential air conditioners will be produced at the new $2 million facility. Two new packaged equipment sales engineers are David E. Washburn and Robert J. Doran, assigned to Pittsburgh and Greensboro offices, respectively . . .

Raymond S. Doherty has been appointed Builder Sales and Promotion Manager, Heating and Air Conditioning Division, **National-U. S. Radiator** Corporation, it was announced today by T. B. Focke, President. Mr. Doherty was formerly Manager of Packet Sales. He will headquarter at the division's main office in Johnstown, Pa. . . .

Lewin-Mathes Co., made some changes recently. Bill Herlihy, formerly in New York, is now Tampa manager; Fred Bratt is added to rod and tube sales in Detroit; Al Dennison is manager of brass rod sales in New York; and Dick Lowrey is manager of the Dallas office . . . New manager of refrigeration sales for Borg-Warner's Industrial Div., York Corp., is Richard C. Niess . . . Dave Levinson and Walter Brodz will handle sales in St. Louis for Acme Industries . . .

Retirement of Glen H. Rearick of **Babcock and Wilcox** Co.'s Tubular Products Division is announced. He had managed the company's Alliance, Ohio, and Milwaukee plants before being appointed a member of the vice-president's staff for special projects . . . Robert R. Henningsen, **Reynolds Metals,** is named assistant manager, appliance and equipment market . . . Wm. J. McKee, formerly general manager of sales, U.S. Steel's **National Tube** Div., is assistant vice-president-sales. He is succeeded by Robert E. Williams . . . General sales manager for **McQuay,** Inc., G.G. (Jerry) Workinger was twenty years with York . . .

Paul W. Wyckoff, chief engineer, will assume direction of all engineering activities for **Airtemp** Div., Chrysler Corp. . . . Albert C. Dickson, chief engineer of **Emerson Electric's** Electrical Division, is promoted to assistant to the vice-president, engineering and research. William H. Thais was named acting chief to succeed Dickson . . . D. H. Hannasch is named manager of **Minneapolis-Honeywell's** sales office in Charlotte, N.C. He succeeds L. Frank Lawrence Jr., who is transferred to Cocoa Beach, Fla. in a sales assignment dealing with the company's government contracts . . . Sales representative in Florida and southern Georgia for **Pittsburgh Corning's** Foamglas insulation, William O. Morin will advise engineers and contractors on application problems . . . E. W. Seay is manager of general advertising for **Westinghouse Electric** . . .

Assignment as field service engineer, for the Florida area, of Frank W. Stokes is announced by wrought iron producer, **A. M. Byers** Co. . . .

• **Elmer R. Weaver,** Chief of the Gas Chemistry Section of the National Bureau of Standards, retired May 31st after 45 years of service. He is a nationally known authority in his field. The techniques he developed for determining the performance of gas-burning appliances are now used as basic procedures in the approval testing of virtually every type of gas appliance sold in the United States. He was also a pioneer in the development of thermal-conductivity measurements for detecting hydrogen in World War I submarines. This has now become the basis of a multi-million dollar instrument industry. In World War II he developed another physical method for measuring the water-vapor content of aviator's oxygen to prevent the clogging of oxygen lines with ice crystals. In 1953, the Department of Commerce recognized Mr. Weaver's work by awarding him the Gold Medal, the Department's highest honor.

• **William McNamara,** 62, a sales manager for Trane for 26 years, died in May after a brief illness. Born in Canada, he moved to St. Paul at the age of 3. He had been a member of ASHAE, ASRE, Engineers Club, and Minnesota Federation of Engineering Societies.

• **James Emmett, Jr.,** 50, vice-president in charge of sales for Jas. P. Marsh Corp., Skokie, Ill., died June 7 of a heart attack. Death occurred en route to his home in Hinsdale, Ill., following a business trip. He was active in the sales division for over 30 years. He was also a past president of Air Conditioning and Refrigeration Institute and was still active as one of its directors.

ASK THE AEROFIN MAN

For the Practical Answer to Your Heat-Exchange Problem . . .

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.

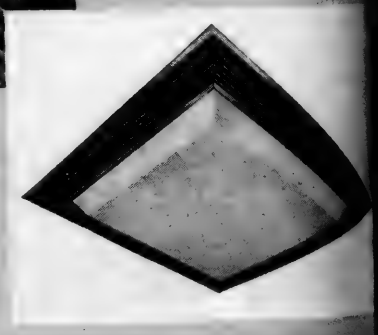
AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

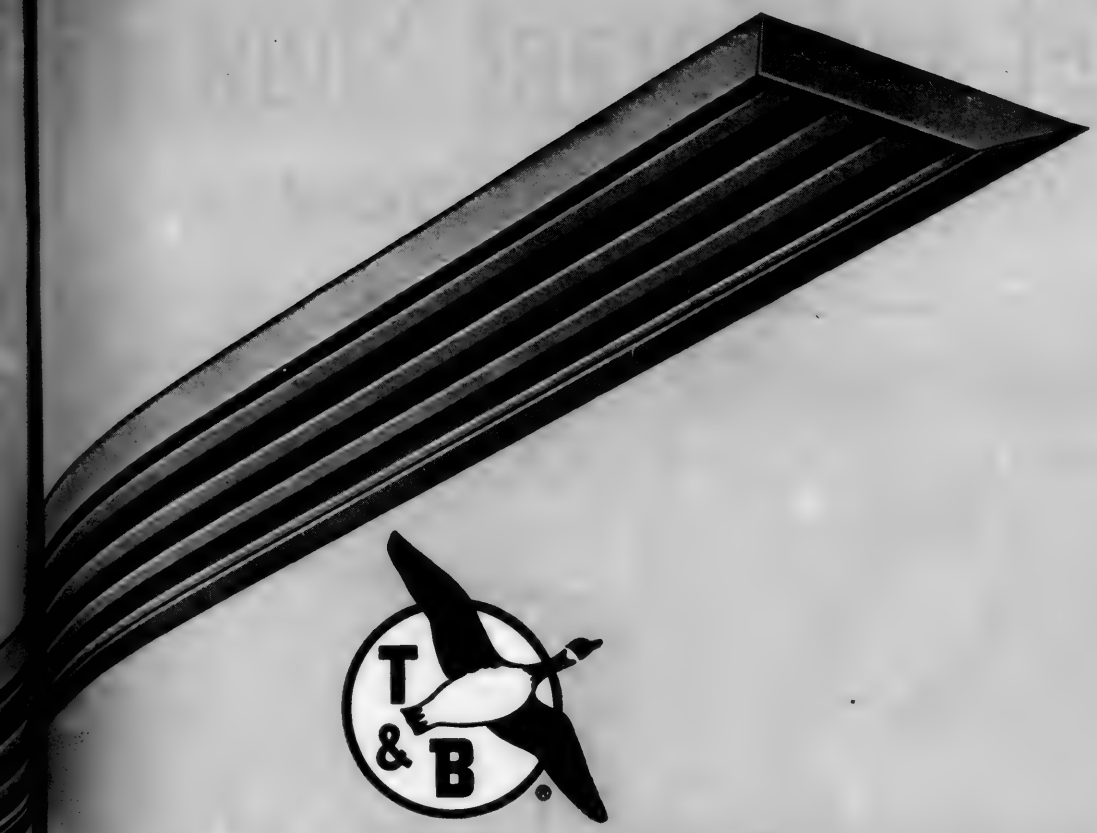
Sections butt without breaks

Trim, attractive end caps

Mitered inside and outside corner sections . . .



. . . ideal for installation with square light fixtures



LINEAR DIFFUSERS

reserve the clean-line symmetry of modern architectural design

For installation on ceiling or sidewall, Tuttle & Bailey Linear Diffusers are designed to maintain the functional straightline beauty of modern architectural concepts. Particularly effective when installed in continuous runs, individual sections butt neatly without breaks, and mitered 90° inside and outside corners permit extension of the clean-line symmetry on perimeter applications. A unique yet simplified method of installation eliminates the need for screws in the margin of the diffuser. Units can also be furnished with a recessed plaster frame which means only the unbroken lines of the louvres are visible.

Tuttle & Bailey Linear Diffusers may be installed on either the supply or return portions of the system. They are available as one-way or two-way blow units in 18", 24", 30", 36", 48", 60" and 72" lengths.

TUTTLE & BAILEY

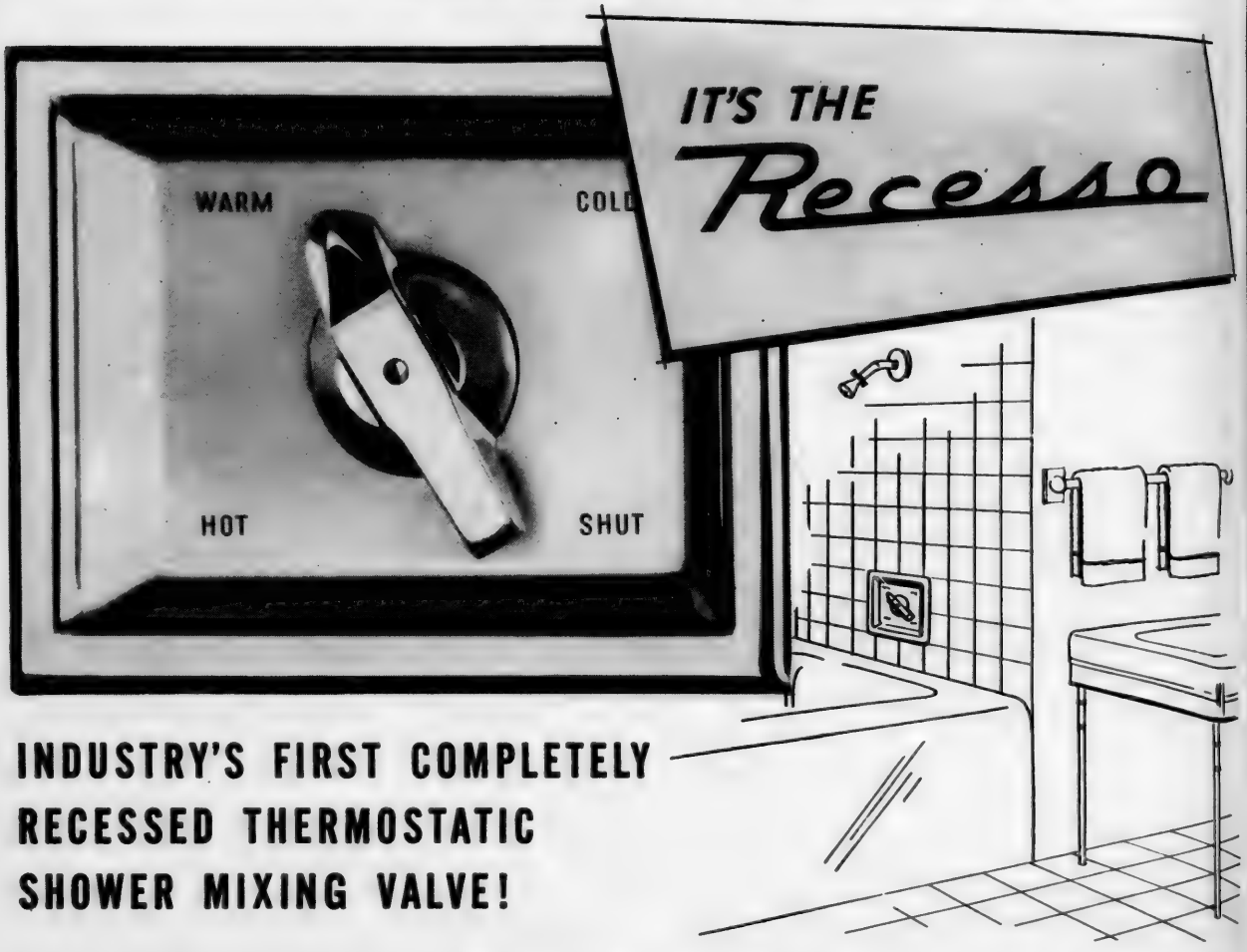
division of Allied Thermal Corp. New Britain, Connecticut

Today . . . write for Catalog No. 114.

FOR

Set and Forget Showers

WITH THE BUILT-IN LOOK!



INDUSTRY'S FIRST COMPLETELY RECESSED THERMOSTATIC SHOWER MIXING VALVE!

PROVIDES BUILT-IN BEAUTY FOR LUXURIOUS SHOWERS!

Designed to go hand-in-hand with today's architectural trends, the RECESSO combines building beauty with rugged performance. It's futuristic styling brings the shower of tomorrow into the bathrooms of today!

NO DANGEROUS PROTRUSIONS!

The RECESSO is completely recessed into the wall. There are no protruding edges to tear or cut. Reduces injuries resulting from shower falls to an absolute minimum.

GREATER SHOWERING COMFORT . . . SHOWERING SAFETY!

New inside as well as out, the RECESSO features a new improved thermostatic valve . . . which provides greater sensitivity. Your customers get more comfortable showering, greater anti-scald protection. Shower automatically shuts off should cold water supply fail.

THE Lawler Line of Thermostatic Control Valves

PERFORMANCE TESTED FOR LONGER LIFE

Steam Temperature Regulators
Thermostatic Shower Mixing Valves
Water Controllers
Tempering Valves

DESIGNERS AND PRODUCERS OF THERMOSTATICALLY OPERATED VALVES SINCE 1895

LAWLER AUTOMATIC CONTROLS, INC., MT. VERNON, N. Y.

Jenni Genetron says:

For refrigerants that are Super-Dry

Always be sure to specify...

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SUPER-DRY REFRIGERANTS

Tops in quality . . . Tops in performance

Available from wholesalers everywhere.

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GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
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PFMA CERTIFIED RATINGS

NEW Peerless-Electric®

Centrifugal Roof Ventilator...

DEVELOPED AND MANUFACTURED WITH APPLIED CENTRIFUGAL BLOWER PRINCIPLES

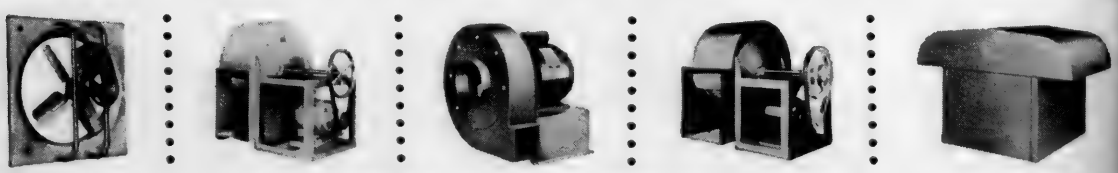
QUIET! . . . Matching wheel cone accurately fits venturi inlet to create quieter, smoother air movement. Excellent for churches, auditoriums, hospitals, and schools.

ADAPTABILITY! . . . Fits standard curb sizes. Lower horsepower ratings for quieter operation. Higher horsepower for commercial and industrial applications.

PERFORMANCE! . . . Each unit air-tested, and rated to assure certified ratings. Construction gives exceedingly high efficiencies. Detailed performance data completely covered in Bulletin SDA-220.

STURDY! . . . All welded construction. All material is 16 ga. or over. Built for the life of the building.

A COMPLETE LINE OF AIR MOVING EQUIPMENT



See our Catalog in Sweets

Charter Member of the Air Moving and Conditioning Association, Inc.

FAN AND BLOWER DIVISION

THE Peerless-Electric® COMPANY

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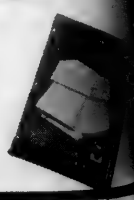
FANS · BLOWERS · ELECTRIC MOTORS · ELECTRONIC EQUIPMENT

Write today for Bulletin SDA-220 on Peerless Centrifugal Roof Ventilators



This is the House that Pete Built—

—in a Suburban American Community,
with wages earned in an American mill,
making quality American products,
for use in American homes everywhere!
—The more American products Pete makes,
the more Dollars he can spend in America!

Note to Contractors: *When you buy American quality tubing and pipe—your dollars build new American projects . . . new markets for YOU!*

READING TUBE CORPORATION

EMPIRE STATE BLDG., NEW YORK 1, N. Y. PLANT: Reading, Pa.

Tubular Sales Offices: READING PA · CHICAGO ILL · OAKLAND CALIF · DENVER COLO · DALLAS TEXAS · ATLANTA GA. 690 Murphy Ave. S.W., Unit 5, Bldg. · WOODSIDE L I N Y · CLEVELAND OHIO 4615 Perkins Ave. · LOS ANGELES CALIF 720 No. Santa Fe Ave. · HOUSTON TEXAS 1121 Rothwell St.

Sold Through Wholesalers Only

Crane No. 960 Bronze Pressure Regulator

for dependable, *precision* control of steam and air pressure

CRANE PRESSURE REGULATORS

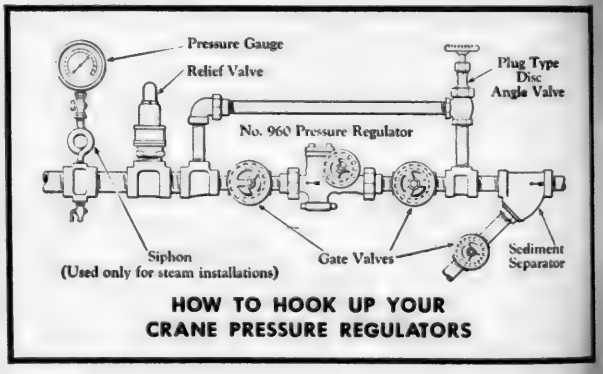
For accurate regulation of steam and air pressure, you're safe and sure when you specify Crane No. 960 Bronze Pressure Regulators.

Because they are Crane-designed and Crane-built for long, trouble-free operating life, these rugged, precision type regulators meet the most exacting requirements of modern heating systems, air blasts, cookers, driers, vulcanizers and other process equipment.

With Crane Bronze Pressure Regulators, outlet pressure cannot build up to inlet pressure when there is no steam or air demand on the outlet side. Equally important, ordinary fluctuations of inlet pressure do not affect the outlet pressure.

NEW LITERATURE ON REQUEST

Available in sizes ½ to 2 inches; maximum inlet pressures 250 pounds air or 250 pounds steam up to 450° F



HOW TO HOOK UP YOUR CRANE PRESSURE REGULATORS

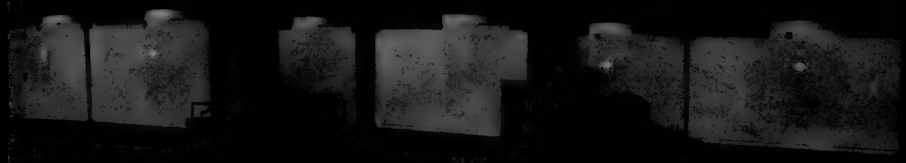
New circular helps you select proper regulator for your needs. Ask your Crane Representative for a copy, or write to address below.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

Hoist it . . . Pipe it . . . Wire it . . .
It's in Service! That's why **NEW**
PACKAGED DOUBLE-FLOW AQUATOWERS*
(80, 100 and 125 Tons Nominal Capacity)
are selling by the Dozen!



Redesigned for greater utility, increased durability and reduced installation cost — that's the story behind the rapid acceptance of New Packaged Double-Flow Aquatowers by engineers and contractors. Cost-wise and performance-wise they are tops in the 80- to 125-ton field for they are built to go on the job quicker, do

Aquatowers do not involve the costly field labor usually associated with installing towers of intermediate capacity. In special situations, they can be partially disassembled into 3 sections and installed quickly. And if necessary, "packaged" Double-Flow Aquatowers can be completely disassembled and put back together with ease and speed.

Easy installation is only one facet of the "packaged" Double-Flow Aquatower's universal popularity with contractors, engineers and users. More important is the proven and unparalleled performance . . . the industrial-type multi-blade cast fan . . . the economy of operation . . . the low, clean-cut silhouette . . . the long-lived baked MarClad plastic finish. For complete data on design, construction, engineering features and performance, call your Marley representative in any of 55 cities.

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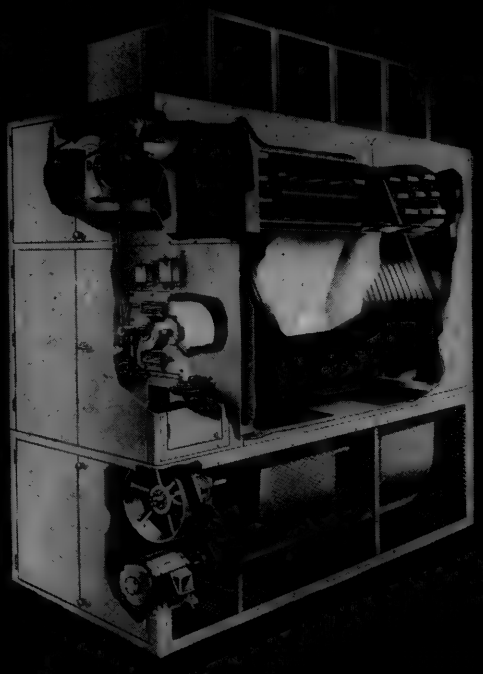
The Marley Company
Kansas City, Missouri

MARLEY



the all-new
Dravo **COUNTERFLO** *heater*
introduces

a new concept in burning fuel

Developed by the most exhaustive research program ever undertaken in the field, the new Dravo *Counterflo* heater introduces an entirely new concept in the burning of fuel. This new concept involves not only many entirely new and exclusive Dravo features, but integrates every part of the heater into a "unitized" design. The functions of the principle elements—burner, combustion chamber, fans and discharge plenum—work in complete harmony, with the result that they extract every possible Btu from the fuel, transmit the heat to the airstream with unmatched efficiency, and distribute the heated air uniformly. Look at these outstanding features of the all-new Dravo *Counterflo:*

- **NEW DISCHARGE PLENUM**—distributes heated air at high velocity without annoying drafts.
- **NEW AIRFOIL COMBUSTION CHAMBER**—stainless steel, ribbed for extra strength and channeling of airflow—guaranteed for 10 years.
- **NEW INDUCED DRAFT FIRING**—automatically controls fuel/combustion air ratio, adds extra safety, extra efficiency.
- **NEW PYROJET BURNER**—exclusively Dravo—first burner developed specifically for direct-fired space heaters. Burns heavy No. 5 oil efficiently. Switches from gas to light oil automatically.
- **NEW LOW-SPEED FANS**—forwardly curved, low-speed, double inlet fans with high efficiency reduce horsepower requirements in the new *Counterflo* drastically.

The new Dravo heater is extremely adaptable. Separate furnace section perfect for use as duct-type furnace, suitable for air conditioning, process drying and air tempering applications. May be mounted in any position to save space. Check with your Dravo representative for full information on this amazingly versatile heater, or write to Dravo Corporation, Pittsburgh 22, Pennsylvania.

Ask for Bulletin 564-27

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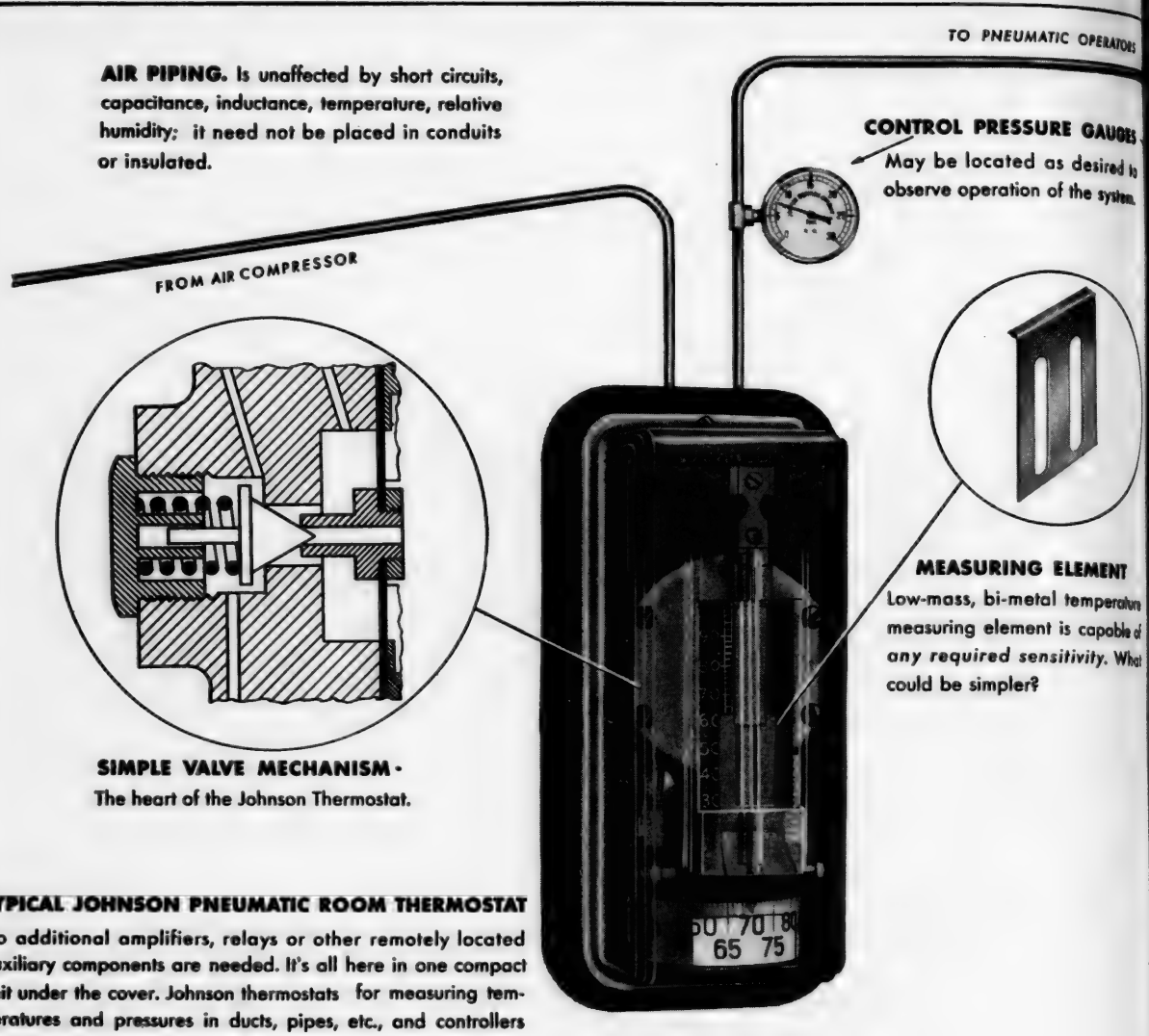
Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation


TO PNEUMATIC OPERATORS
AIR PIPING. Is unaffected by short circuits, capacitance, inductance, temperature, relative humidity; it need not be placed in conduits or insulated.
CONTROL PRESSURE GAUGES. May be located as desired to observe operation of the system.
FROM AIR COMPRESSOR
MEASURING ELEMENT
Low-mass, bi-metal temperature measuring element is capable of any required sensitivity. What could be simpler?
SIMPLE VALVE MECHANISM.
The heart of the Johnson Thermostat.
TYPICAL JOHNSON PNEUMATIC ROOM THERMOSTAT
No additional amplifiers, relays or other remotely located auxiliary components are needed. It's all here in one compact unit under the cover. Johnson thermostats for measuring temperatures and pressures in ducts, pipes, etc., and controllers for relative humidity are equally simple.

INSURE SYSTEM-WIDE SIMPLICITY

For All Types of Industrial and Commercial Applications—Air Conditioning • Heating • Cooling • Ventilating • Humidifying • Dehumidifying • Processing

The basic components of Johnson Pneumatic Control, shown above, reveal how remarkably simple and free from complication the best control systems can be.

The Johnson Room Thermostat—the world's most accepted thermostat—is a refined reducing valve in a compressed air line, set and reset automatically by an accurate bi-metal temperature measuring element, to transmit compressed air, at varying pressures, to valves, dampers and other devices.

Johnson Diaphragm Valves and Damper Operators are equally simple devices with flexible, long-life diaphragms which are moved as the thermostat transmits changes in air pressure. Only pneumatic control gives you system-wide simplicity.

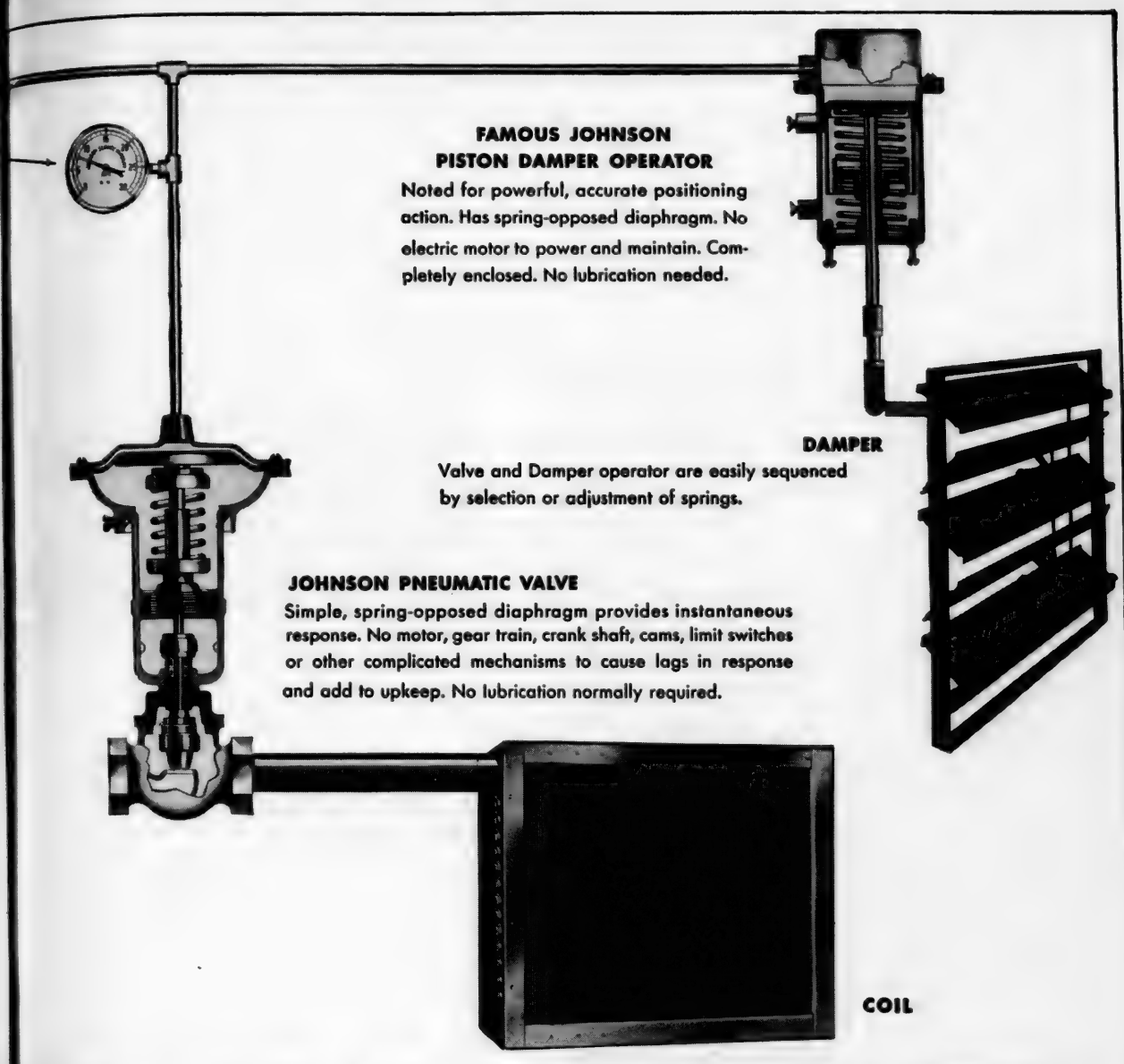
The widespread use of pneumatic power by other industries offers further evidence of its simplicity and adaptability. Examples include truck and train brake systems, industrial power tools, hoists, bus suspension systems, lubricating equipment, machine tools and countless others.

Compare *systems* carefully. You'll discover that Johnson pneumatic apparatus is simpler by far and that you can do control work with just a fraction of the components that would otherwise be required.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885



FAMOUS JOHNSON PISTON DAMPER OPERATOR

Noted for powerful, accurate positioning action. Has spring-opposed diaphragm. No electric motor to power and maintain. Completely enclosed. No lubrication needed.

DAMPER

Valve and Damper operator are easily sequenced by selection or adjustment of springs.

JOHNSON PNEUMATIC VALVE

Simple, spring-opposed diaphragm provides instantaneous response. No motor, gear train, crank shaft, cams, limit switches or other complicated mechanisms to cause lags in response and add to upkeep. No lubrication normally required.

COIL

WITH JOHNSON PNEUMATIC CONTROL

YOU'LL BE BETTER SATISFIED with PNEUMATIC BECAUSE TODAY'S PNEUMATIC CONTROL

- *Has fewer components per system.*
- *Is highly accurate, dependable—has fewer components subject to failure.*
- *Is easier to operate—easier, less costly to maintain.*
- *Offers the widest choice of compensating, sequencing and other operating features.*
- *Provides the necessary flexibility to solve even the most intricate control problems.*
- *Is completely safe under all conditions.*

Let Johnson demonstrate how the advantages of pneumatic control can be applied to your specific problems. Use the coupon or call in a nearby Johnson engineer. No obligation, of course.

WIDEST EQUIPMENT SELECTION

Johnson makes the most complete line of pneumatic control equipment for solving any problem of temperature, humidity or pressure control. Equipment includes thermostats, recorder-controllers, valves, dampers, damper operators, pressure regulators, humidostats, humidifiers, thermometers, switches, special controllers and related apparatus.

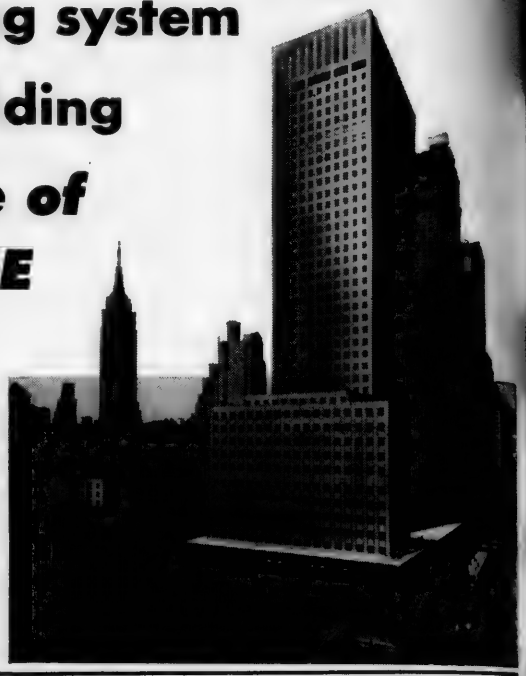
Complete engineering, sales and service facilities are available through 104 direct branch offices in the United States and Canada.

JOHNSON SERVICE COMPANY
507-C East Michigan Street, Milwaukee 1, Wisconsin

☐ Please have a Johnson engineer call on me.
☐ Send your condensed catalog of Johnson equipment.

Name_____ Title_____
Firm_____
Address_____
City & State_____

Ingenious air-conditioning system of Socony-Mobil Building *makes liberal use of* NATIONAL PIPE



Owner: GALBREATH CORP., JOHN W. GALBREATH AND PETER B. RUFFIN
Architects: HARRISON & ABRAMOVITZ
Associated Architect: JOHN B. PETERKIN
General Contractor: TURNER CONSTRUCTION COMPANY
Mechanical Engineers: JAROS, BAUM & BOLLES

This gleaming, 45-story, stainless-steel-sheathed building is the largest air-conditioned office building structure ever erected. Its remarkable air-conditioning system is powered by purchased steam, which is actually used twice. In the basement there is a refrigeration plant, consisting of 3 centrifugal steam turbine driven compressors of 2600-ton capacity. These 3 units are driven by steam turbines operating full condensing, with the exception of one which is a partial condensing and exhaust. This exhaust steam, by means of a 10-inch steam main, is tied in with the building's steam distribution system. This 10-inch main serves, during summer operation, all the steam requirements for the tempering coils in the air-conditioning system, as well as the steam required for three 500 Lithium Bromide Absorption Machines. In other words, the three 500-ton units act as a surface condenser for the exhaust steam—the building enjoying the economics of this ingenious piping layout.

Approximately 470 tons of USS NATIONAL Pipe—most of it Seamless—were used in the construction of the air-conditioning and heating systems. And at least 350 tons of NATIONAL Seamless were used in the huge building's plumbing system.

As is so often the case in designing complex plumbing and heating systems, the engineers selected NATIONAL PIPE. They knew from past experience that, no matter how rigorous the conditions, NATIONAL would do the job, and do it well.

If you'd like more information on the use of NATIONAL PIPE in plumbing and heating, air-conditioning and power installations—large or small, simple or complex—get in touch with us. Our experienced engineering staff is at your service.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL PIPE

UNITED STATES STEEL

"H" Sky-Vent, 84" size (100,000 CFM), one of four now ventilating a new lic utility power plant in Michigan. Shipped as a complete preassembled unit.

66" Style "V" Sky-Vent exhausting 98,000 cfm from enameling oven area of major appliance factory in Kentucky; one of 16 such units at this plant.

ASY TO INSTALL "BUFFALO" SKY-VENT® PACKAGE ROOF VENTILATORS OFFER RUGGED CONSTRUCTION—MAINTENANCE-FREE OPERATION

ere are extremely rugged power roof ven-lators with important advantages to you d the customer:

1. For exhausting or ventilating large eas where ductwork may not be desirable.

2. In large capacity range, 1000 thru 0,000 cfm, to permit a minimum number roof installations — reducing costs.

3. Shipped as ready-to-install units — ving you time and trouble.

4. Built to last! Heavy-gauge stacks with tegral curb flanges. Internally braced hoods — moisture proof, wind proof, corrosion resistant.

5. Efficient air handling with standard lines of "Buffalo" Propeller and Axial Flow Fans.

Write for Bulletin FM-2345 and check these increasingly popular package units against your requirements. Your assurance of performance is the "Q" Factor in every "Buffalo" product — the built-in Quality which provides trouble-free satisfaction and long life.

VENTILATING

AIR CLEANING

AIR TEMPERING

INDUCED DRAFT

EXHAUSTING

FORCED DRAFT

COOLING

HEATING

PRESSURE BLOWING

BUFFALO FORGE COMPANY

BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Rugged construction clearly indicated in view of 66" Style "V" stack. Note ample heavy stack bracing and internal plate gussets to support heavy motor.

Right, showing raised hood of 42" Style "H" unit. Note rigid internal tubular frame in head, easy access to motor and neat appearance — units spray-coated both inside and outside with ⅛" thick cork impregnated fire and moisture resistant compound.

Now, trim new Wall-Fin
custom styling with

New functional beauty! TRANE Wall-Fin brings draft-free heating plus modern design to long wall and window areas. Large tube diameters make it especially suitable for loop systems where pressure drop is critical. Element is mounted on ball bearings to provide free, silent expansion with no strain on enclosure. New reinforced construction holds shape during shipment and installation. Available in a wide variety of styles to suit any building plan.

rom Trane gives you roduction models!

Simple, rugged construction and smoothly fitting components give you "custom-built" appearance on every job

hen you specify new TRANE Wall-Fin, you can epend on getting a trim, neat job with smooth ints and perfect alignment every time. And new RANE Wall-Fin is ruggedly built with die-formed arts . . . custom-fitted components that will take ears of hard use—yet retain their sleek, tailored ppearance. Reinforcing channels and gussets at points f strain prevent sagging, bending.

The new TRANE Wall-Fin has been designed with ewer parts . . . with *precision-held dimensions* on all arts to assure a "custom-built" appearance with far s on-the-job fitting and tailoring. New slip-joint construction makes it easy to align, with smooth fit of all joints assured.

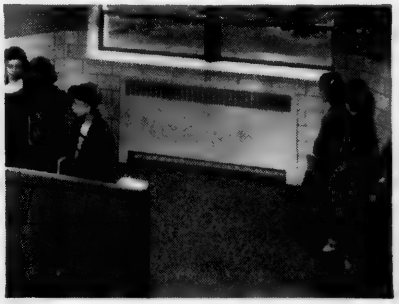
Since 1925, TRANE has pioneered in developing and improving radiation products. Now the broadest, most complete line in the industry, TRANE offers you everything you need for any radiation job—whether it's a single room or hallway, or the largest school or hospital. And when you turn to TRANE, you simplify procurement, pinpoint responsibility for *all* your radiation needs.

So for your next job, turn to TRANE! Just call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.

Check these new TRANE Wall-Fin features:

- Extra rugged construction—reinforcing channels and gussets at points of strain.
- Precision-held dimensions on all parts—less on-the-job fitting. Fewer parts to assemble.
- Element glides silently on ball-bearing cradles for free expansion without strain on enclosure.
- All mountings are *inside* the cabinet—no interference when cabinet meets baseboard or coving.
- Smoother fit and easier alignment due to slip joint construction.
- Rubber channel strip seals cover to wall.
- Speedier fit-up of all key parts. Slotted holes for element and enclosure; rigid channel-reinforced top edge for easy, tight-to-the-wall fit without bolts or screws; snap-on bottom edge; pre-drilled holes for end laps.
- Wide range of styles, sloping, top or front outlet—available in 4″ and 5¼″ depth and three heights, for steam or hot water.
- Complete precision-built accessories—dampers, access doors, pilaster covers and end panels give real custom-built appearance.

Convectors combine efficiency with actness and beauty. Aluminum-copper element responds quickly, provides stantly . . . eliminates wasteful over-. Can be installed free-standing, or wall-hung. 21 cabinet styles to om.



TRANE Wall-Line Convectors are designed for relatively short runs and very high capacity—providing attractive, modern wall-to-wall installations in schools, office buildings, hospitals and institutions. Compact and rugged construction, with extra reinforcements and full back.

For <u>any</u> air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • EASTERN MFG. DIV., SCRANTON, PA. • TRANE COMPANY OF CANADA, LTD., TORONTO
90 U. S. AND 19 CANADIAN OFFICES

Pittsburgh Superfine is applied to air conditioner cabinet. Ease of handling has cut this operation time 50%. Superfine does not disintegrate or flake off.

(Below) Pittsburgh Superfine improved working conditions at Chrysler Airtemp since it does not flake off or injure hands of workers.

Pittsburgh Superfine cuts installation time 50%, helps produce better end products at Chrysler Airtemp

Production requirements at the Airtemp Division of Chrysler Corporation, Dayton, Ohio call for a flexible, well-bonded, efficient glass fiber insulation for air conditioning and heating units to prevent condensation or heat transfer at metal cabinet walls. Pittsburgh Superfine fulfills these requirements.

Glass fiber insulation previously used flaked off, would be ejected by the air stream. Measures improvised to correct this were costly and added production time.

But PPG Superfine, being specially bonded, avoided this disintegration. Superfine prevents condensation on cabinet walls and eliminates excessive temperature rise in heating unit enclosures.

Easier handling, too!

The rigid, brittle glass fibers of the material previously used caused dangerous cuts on workers' hands, despite heavy gloves. The old material was hard to position during assembly.

Now with Pittsburgh Superfine, installation time is cut in half. Superfine is flexible, easy to handle, does not flake off or cause cuts. Working conditions are much improved.

What can Pittsburgh Superfine do for you?

Pittsburgh Superfine offers you top insulating results in heat or cold applications . . . and in sound deadening, too! Find out about all its advantages. Then give it a try. For more information, write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

PITTSBURGH SUPERFINE IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh and St. Louis

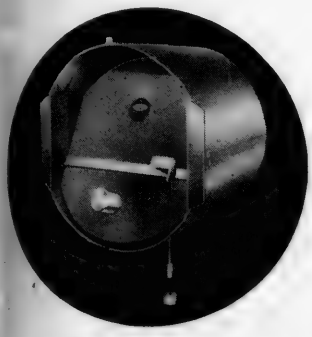
FIBER GLASS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

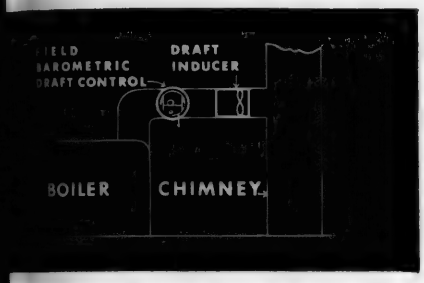
PITTSBURGH PLATE GLASS COMPANY

FIELD BAROMETRIC DRAFT CONTROLS

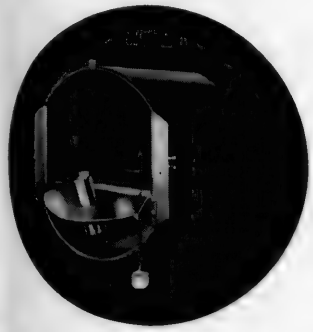
increase the efficiency of induced-draft installations



FIELD TYPE "M" Barometric Draft Control for coal or oil, sizes up to 32".



Field Barometric Draft Control installed in connection with a draft inducer prevents fuel waste caused by wide variations in draft.



FIELD TYPE "MG" Barometric Draft Control for gas or oil-gas, sizes up to 32".

When a draft inducer is used, to assist a faulty chimney, or to permit modern, low-stack construction, a Field Barometric Draft Control should also be installed. In such an installation, the inducer can be set to meet maximum, "high-fire" draft needs without risk of excessive draft. Whenever the draft requirement is less than the draft inducer setting, the Field Control automatically reduces the draft. Here is why the Field Draft Control can make an important contribution to efficiency at all firing rates:

1 - During "off-fire" periods, even the *natural* draft present may be excessive. Field reduces the draft, prevents rapid cooling of the boiler.

2 - During "low-fire" periods, the artificially induced draft may be greater than needed to vent a relatively small volume of gases. Field regulation prevents the loss of high temperature gases.

3 - During "high-fire" periods the Field Control compensates for continuously variable factors effecting draft. For example:

Changes in line voltage, effecting blower speed, change the volume of gases handled and thereby effect the draft.

Changes in resistance caused by the accumulation of fly ash or soot in boiler and breeching cause changes in the draft needed.

Changes in wind and outside temperature, effecting natural draft, cause variations in the artificial draft needed.

Where a number of boilers are discharging into a common stack, the need for draft will vary as firing rates vary. Draft required with all boilers on "high-fire" may be excessive when one or more boilers cut out.

A Field Barometric Draft Control, sensitive to the slightest change in pressure, corrects for any variation, holding draft to the required setting. Write us for technical data. Field Draft Controls are available in sizes up to 32 inches for oil, gas, coal and oil-gas installations.

field

FIELD CONTROL DIVISION

of H. D. Conkey & Company, Mendota, Illinois

AFFILIATES:
Conco Building Products, Inc. • Brick, Tile, Stone — Conco Materials Handling Div. • Cranes, Hoists

Represented in Canada by Ontor Limited, 12 Leswyn Road Toronto 10, Ont., Canada

SIX-GOAL MAN FAILS TO FLAKE TI-CO®

Captain Pat Conners, six-goal man and Captain of one of the Midwest's top polo teams, the Shamrocks, examines dented, but unflaked sheet of TI-CO after his repeated drives of a polo ball driven into it at 85 mph.

Not many applications require TI-CO coating to withstand punishment equal to the 85 mph slam of a polo ball. But, you can see how this unusual test does demonstrate the ability of TI-CO to take the toughest sheetmetal shop fabricating operations . . . crimping, lock-seaming, brake forming . . . without cracking or flaking of the zinc coating.

TI-CO's secret is in the patented Sendzimir process which produces a flexible galvanized sheet with a tightly adhering zinc coating that flows with the base metal as it is being fabricated. Non-flaking TI-CO eliminates costly down time and clogging of machines.

8 reasons why Inland TI-CO Galvanized Sheets are best for every sheet metal job

TI-CO won't flake—Test after test proves that the zinc coating on TI-CO galvanized sheets will not flake off. They take tough 180° bends in stride and the coating stays put. Reruns of ductwork made necessary by coating failure are eliminated.

TI-CO sheets are easy to fabricate—Any forming operation that can be done with cold rolled steel can be accomplished with Inland TI-CO. TI-CO performs beautifully in the Pittsburgh lockseamer and the coating stays put! TI-CO eliminates machine down time caused by zinc clogging.

TI-CO sheets last longer—There are no "call backs" due to rusting of the ductwork when you use TI-CO. Even after the toughest forming operations, TI-CO's zinc holds on tight to protect installations and increase the service-life of even the parts which may be exposed to snow, ice, rain or salty atmosphere.

TI-CO sheets are uniform—Modern manufacturing methods employed in the production of TI-CO sheets insure uniform quality, gage and coating thickness.

TI-CO sheets won't burn—Ductwork made from TI-CO galvanized steel sheets will not burn, providing an excellent barrier to the spreading of fire.

TI-CO sheets are easy to solder and weld—Once the operation is set up, soldering or welding Inland TI-CO is easier and faster. TI-CO's uniform coating eliminates the constant adjustment of welding equipment that is often necessary with ordinary galvanized sheets.

TI-CO sheets are strong and durable—Hammering down a Pittsburgh lock-seam proves both base metal strength, and TI-CO's ability to withstand the toughest forming operations without flaking, cracking or peeling.

TI-CO sheets make quiet ductwork—TI-CO has a low Coefficient of Linear Thermal Expansion. This means it expands less under heat and contracts less when cooling than other metals commonly used for this purpose.

If you are not already doing so, it will pay you to specify Inland TI-CO galvanized sheets for all of your sheet metal requirements. Always look for the TI-CO brand on your sheets.

TI-CO is available in cut sheets or coils, in gages 8 to 30 inclusive and widths as great as 60 inches. TI-CO comes with dry, oiled or chemically treated surfaces. Consult your local steel distributor or Inland representative for your requirements.

TI-CO Galvanized Sheets are now readily available! The terrific demand for this high quality sheet has kept TI-CO in short supply since its development. Now, additional production facilities have been completed, making greater quantities available.

Write today for a free informative booklet on TI-CO to:

INLAND STEEL COMPANY

38 South Dearborn Street • Chicago 3, Illinois
Sales Offices: Chicago • Milwaukee • St. Paul • Davenport
St. Louis • Kansas City • Indianapolis • Detroit • New York

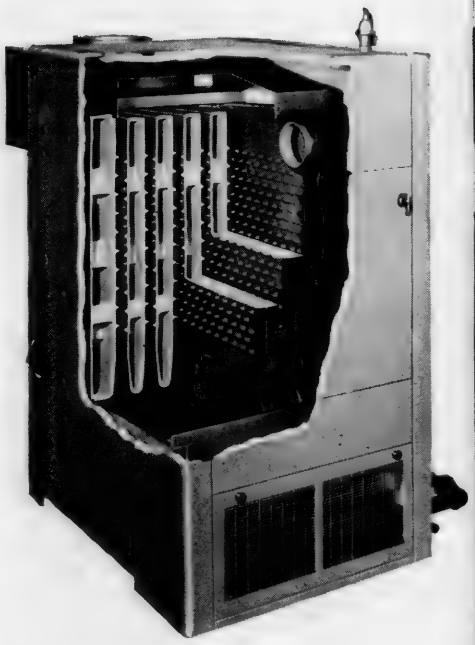
INLAND TI-CO ®

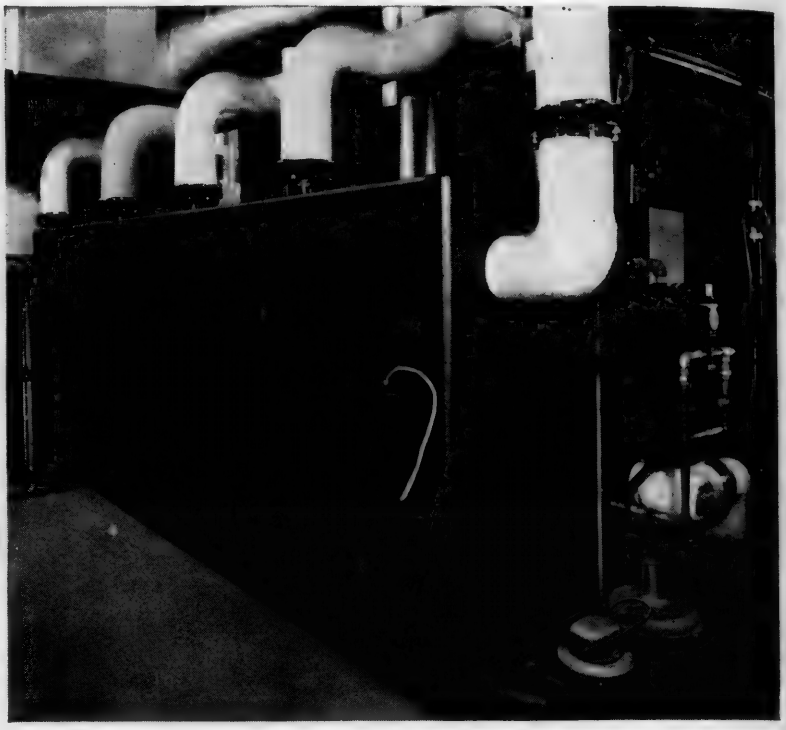
look for this brand—
your assurance of
non-flaking performance

You'll find what you're looking for in the

WEIL-McLAIN TYPE "J"

GAS FIRED CAST IRON BOILER





Barnett Detroit Cartage Co., Detroit, Michigan is heated with a Weil-McLain J-37-S Boiler with a capacity of 4,500,000 AGA input BTU/hr. The contractor says: "The ease of installation of such a big boiler was amazing to myself and the men. The pick-up and efficiency of this boiler is another good feature."

Heating Contractor: Regal Plumbing & Heating Co., Inkster, Michigan
Distributor: Warren Plumbing Supply Co., Detroit, Michigan

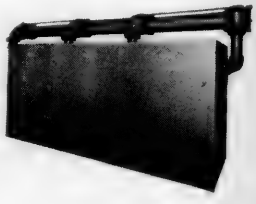
Fuel economy will certainly be high in your list of qualifications. That's why you are urged to critically compare the design of burning equipment and heat absorbing surfaces in the Weil-McLain Type J Boiler. Ribbon burners are carefully engineered to develop exceptional gas burning efficiency and the unique construction of the sections effectively soaks up heat.

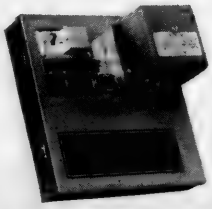
The Type J Boiler is *cast iron*—strongly resistant to the corrosive effects of gas firing. It is sectional in construction—easy to erect in minimum space—easy to enlarge if added capacity is ever needed. The horizontal draft divertor materially reduces necessary head room.

NEW FEATURES

EASY-FIT HEADER

Assures correct header piping for proper steam development and release. Equipped with Dresser compression fittings—offers all the advantages of a swing header without the added erection costs. Easy-Fit Headers are machined and prefitted at the factory and shipped partially assembled, with all parts clearly marked for easy erection on the job. Write today for engineering data.





ELECTRONIC CONTROL PANEL

This complete gas boiler control panel reduces electrical work to a minimum. With its compact grouping of identified components, visual indication of operation and easily understood operating instructions, this electronic control assures lower installation cost as well as correct operation of the boiler.

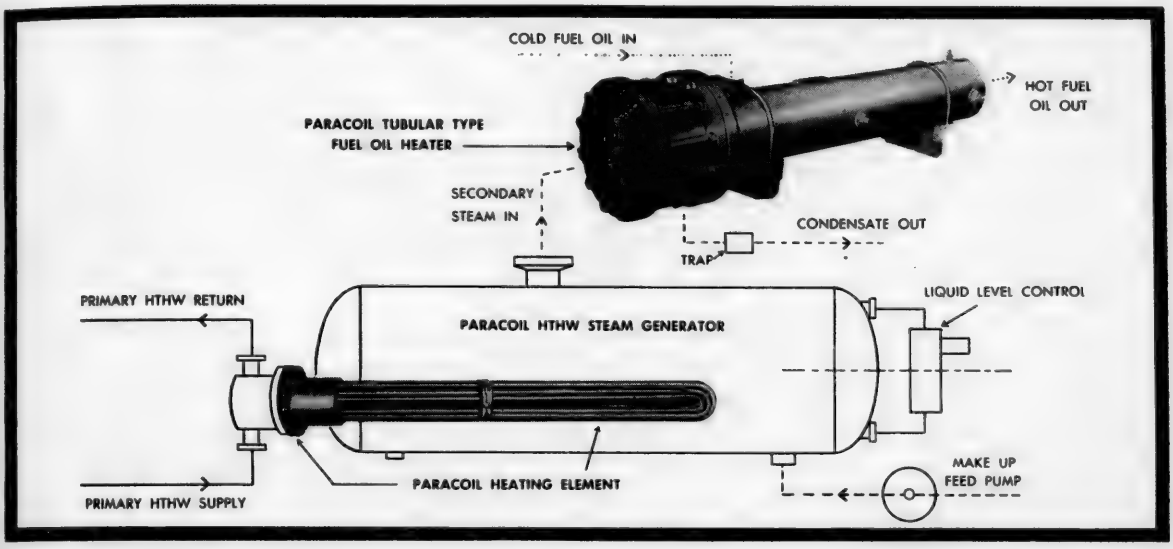
WEIL-McLAIN BOILERS · RADIATORS

WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

Address literature requests to Dept. BB-67

CUT ALONG DOTTED LINE AND SAVE

Idea no. 1 from Paracoil



How to use secondary steam to pre-heat no. 6 oil in a High Temperature Hot Water system

Paracoil engineers know that the first consideration in the design of an oil preheating system for an HTHW installation must be absolute freedom from the possibility of oil leak contamination of the main HTHW stream. A completely isolated oil preheater circuit is recommended. This can be accomplished by means of a secondary heat transfer circuit that does the actual heating. In this way, only the secondary circuit is exposed to possible contamination — the main HTHW circuit is protected at all times.

One of the ways that this isolation is achieved is illustrated above. Additional isolation circuits will be commented upon in future "Idea Sheets". Watch for them!

How to design a protective circuit

1. **Install a steam generator.** Use a Paracoil Heating Element with the HTHW main energy stream as its heat source. With water at 350° F, steam at 25 psig (267° F) can be easily generated in an economically sized unit.
2. **Use the steam thus generated** . . . to heat the fuel oil in a Paracoil Tubular Oil-Type Fuel Oil Heater.* This type heater provides the highest rate of heat transfer — more than **three times** that of the conventional straight tube type.
3. **The condensate from the oil heater** . . . may be returned to the steam generator or sent to waste depending upon plant policy. If the re-use of the condensate is important, absolute surety of its quality can be obtained through the use of the Paracoil Oil Leak Condensate Inspection System.*

Paracoil engineers have designed and built many oil preheater protective systems for both stationary and marine installations. They now offer their experience and know-how to all who are involved in HTHW activities.

Write for complete data.

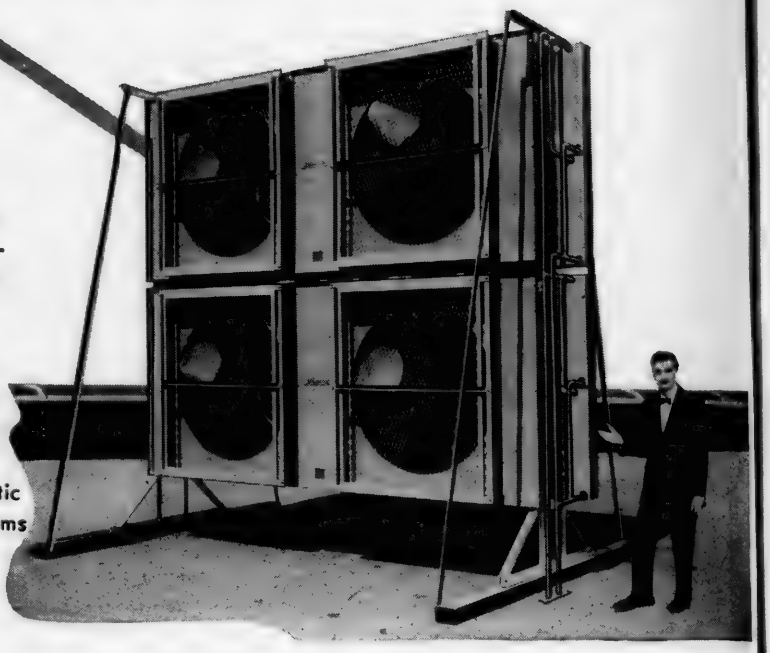
DAVIS ENGINEERING CORPORATION

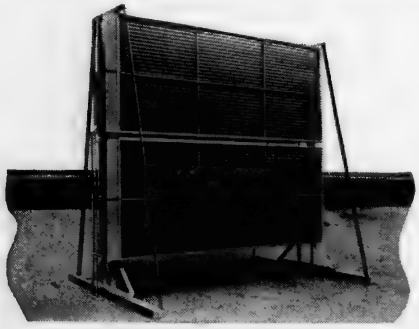
30 Rockefeller Plaza, New York 20, New York • Circle 6-5650

CUT ALONG DOTTED LINE AND SAVE

KRAMER UNICON GETS BIGGER and BIGGER

There is only one answer to large capacity condenser problems — the KRAMER UNICON. Every day more engineers plan larger tonnage installations — 50, 100 and even — 800 tons. And every day UNICONS are shipped to all parts of the world for giant-sized installations. No other air-cooled condenser can match the long, successful record of UNICON, backed by thousands of applications since 1937 — in the widest range of tonnages and climatic conditions. Your condensing problems can be best answered by use of the best — the KRAMER UNICON.





Space-saver UNICON, *as illustrated,* serves a 60-Ton air conditioning system, yet takes but 70 sq. ft. of roof space.

UNICON is a remote-type air-cooled condenser that requires no water. KRAMER UNICON can be used with any size compressor, REGARDLESS of horsepower. Any size refrigeration or air conditioning system can be air-cooled with UNICON, REGARDLESS of tonnage. UNICON requires less horsepower, less piping, is easier to install and costs less. KRAMER UNICON performs best — even in semi-tropical climates.

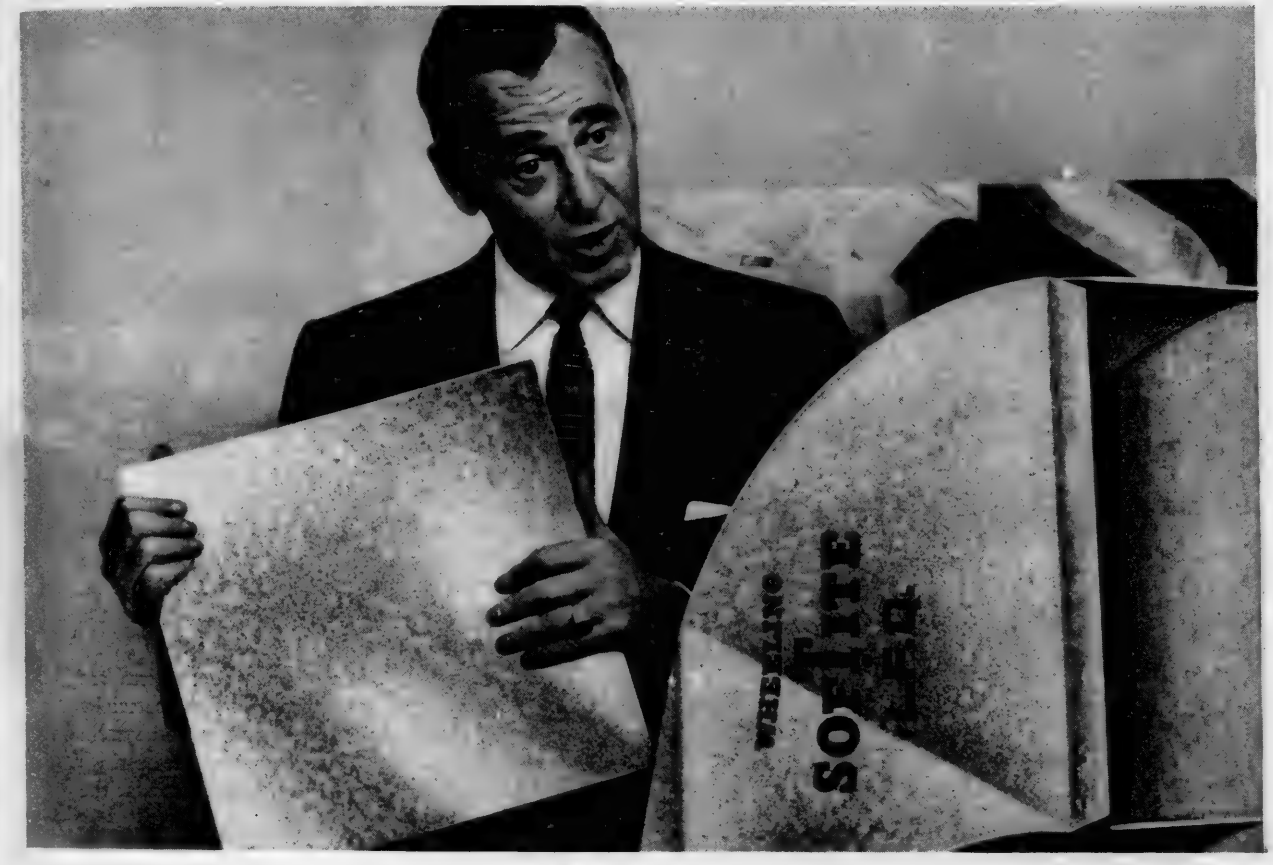
WRITE FOR BULLETIN U-210D

KRAMER TRENTON CO. • Trenton 5, N.J.

"Not only is this sheet easier to work...

but it takes every bend and fold...

without chipping or flaking, because...



Wheeling sofTite has the tightest zinc coating yet produced"

What makes Wheeling sofTite different from other galvanized sheets? Just ask any sheet metal man or air conditioning contractor who has tried them.

They'll tell you that Wheeling sofTite takes every bend, every crimp, every tortuous fold without ever cracking or peeling. That's because sofTite is ductile, so it's easy to work. At the same time it has the tightest zinc coating yet produced. That's why sofTite ducts look so good, last so long, and give service above the call of duty.

If you would like to enjoy all these advantages, make a note right now to try Wheeling sofTite.

Call your Wheeling industrial supply distributor, the Wheeling sales office nearest you, or write Wheeling Steel Corporation, Wheeling, West Virginia.

IT'S WHEELING STEEL

WHEELING STEEL

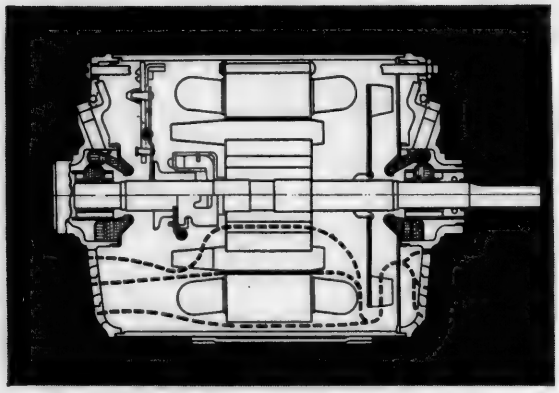
District Sales Offices—Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling

OUR CHALLENGE STANDS: ANYTHING THAT CAN BE MADE OF STEEL SHEETS CAN BE MADE OF WHEELING sofTite GALVANIZED SHEETS

DESIGN ENGINEERS!

This compact, cool-running fhp motor saves space and weight... mounts at any angle

the WAGNER "48"



OUTSTANDINGLY EFFICIENT COOLING SYSTEM

Schematic drawing shows how a large volume of air is directed through the motor to effectively reduce temperatures. Large blower at right draws air in through drip-proof openings in back endplate, forces it around back coil extension—through rotor vent holes—air gap—and through passages between stator core and frame. Cast blower at left circulates air around coil extension and drives it out the motor through front endplate openings.

Savings in space and weight are among the many advantages of using Wagner "48" capacitor-start or split-phase motors in your equipment. These motors come in the standard 48 frame sizes and weigh from 3 to 8 pounds less than the previous models in the same hp ratings.

Because no parts of the motor mechanism are housed in the endplates, it is possible to materially reduce their depth. An effective lubrication system assures positive protective lubrication for the bearings in any position. You can mount these motors at the angle best suited to your equipment.

The capacitor-start, Type RK "48" comes in 1/6 or 1/4 hp ratings, and the split-phase, Type RB "48" in 1/6, 1/4 or 1/3 hp. Both types are available with resilient bases or with rigid bases that are welded to the steel motor frames for ruggedness and strength. You can get these motors from leading motor distributors in your community and from Wagner sales offices in 32 principal cities. Check your telephone directory for the supplier nearest you. Write for your file copy of NEW Bulletin MU-217 on the Wagner "48".

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

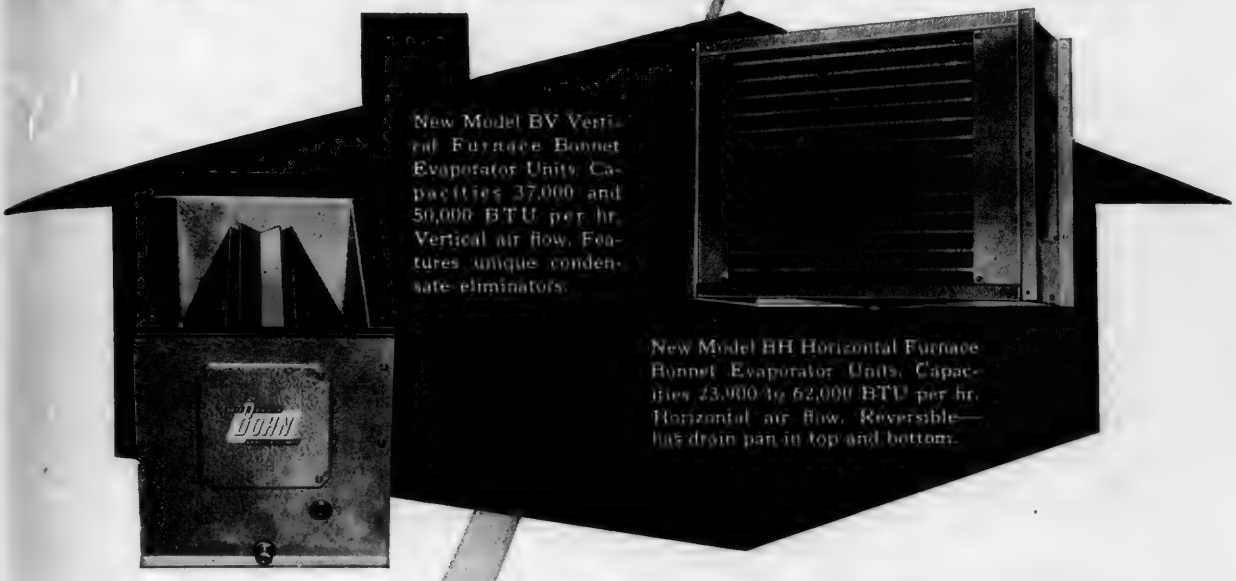
M57-13

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BOHN Presents the NEW ANGLE


New Model BV Vertical Furnace Bonnet Evaporator Units. Capacities 37,000 and 50,000 BTU per hr. Vertical air flow. Features unique condensate eliminators.
New Model BH Horizontal Furnace Bonnet Evaporator Units. Capacities 23,900 to 62,000 BTU per hr. Horizontal air flow. Reversible—has drain pan in top and bottom.
BOHN

Residential Evaporator Air Conditioning Units

No Dead Air Space • Insulated Cabinets

The NEW ANGLE in residential air conditioning design offers you many selling and installation advantages!

Only BOHN units provide a patented distributor employing a low pressure drop venturi which aids compressor efficiency. **Minimum pressure drop. No equalizer required.**

Only BOHN units contain special condensate drains to separate water from air flow in either direction! **Air flows efficiently through the coil for maximum heat transfer *without dead air space.***

Heavy gauge grained aluminum cabinets and access panels are insulated to eliminate exterior sweating! **Rust-proof. No painting required.**

All models are U L listed. For details and specifications, request BOHN CATALOG BU-1.

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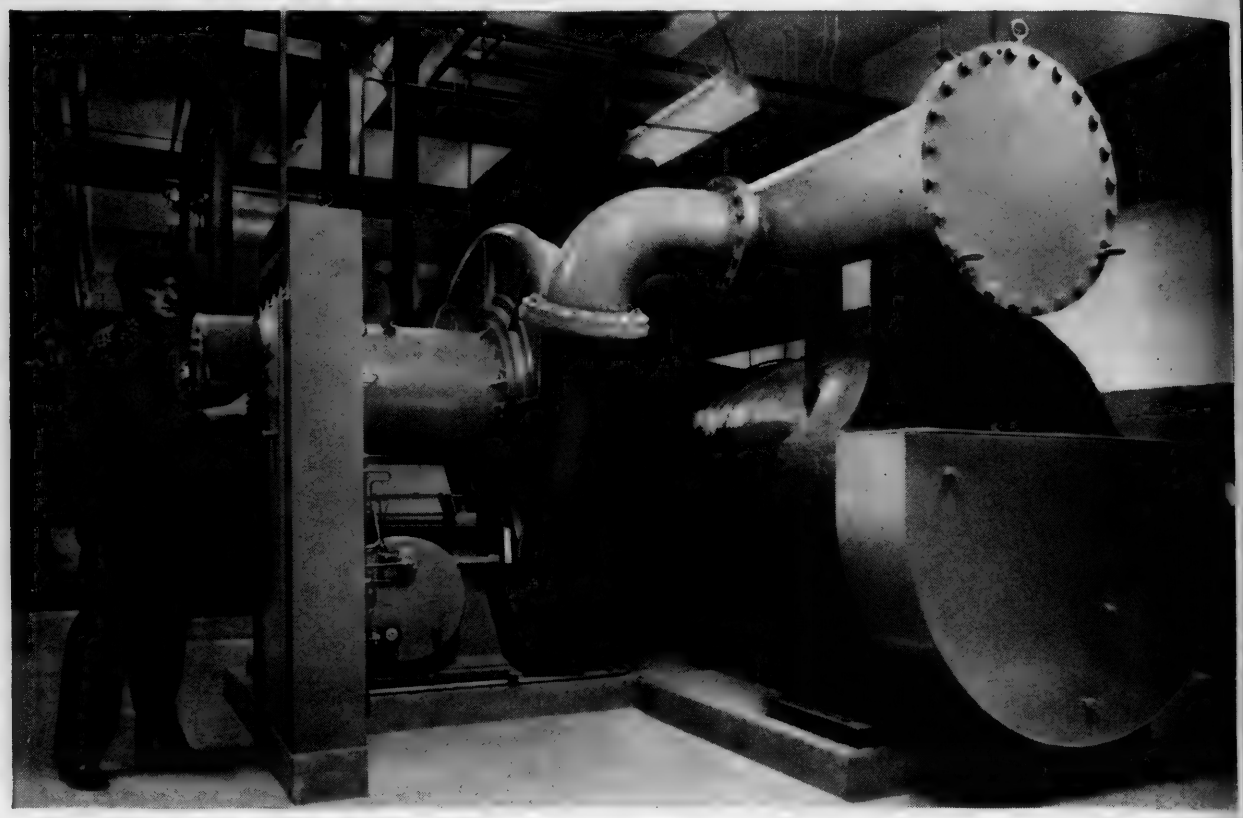
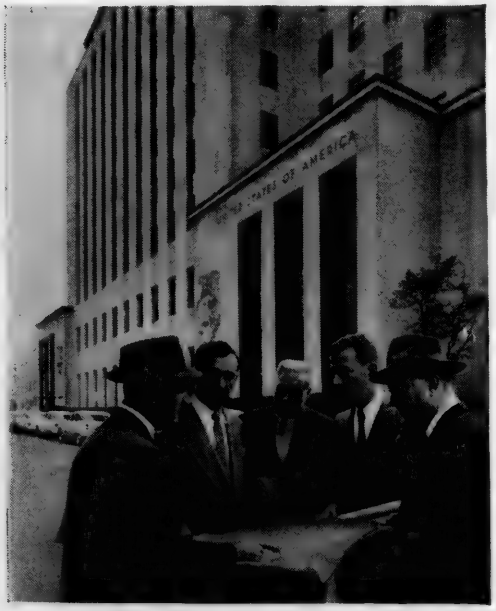


New Orleans Federal Office Building's Tonracs maintain constant chilled-water temperature—regardless of load.

Tonrac provides air-conditioning load variations from 0 to 100% in New Orleans Federal Building



Teamwork like this brought effective air conditioning to the Federal Office Building, New Orleans. L. to r.: I. A. Lindberg, American Blower; G. M. Graf, group supvr., General Services Administration; E. A. Stack, chief engineer, Federal Building; G. A. Hero III and A. A. Hero, Comfortair Co.

To provide controlled indoor comfort, the U.S. Government installed air conditioning in their New Orleans Federal Office Building.

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"After inspecting available units, Tonracs were selected because they were found to be most flexible, easy to install; and they met and exceeded government requirements.

"In this installation, humidity control was the primary factor. Not only was it necessary for the Tonracs to operate at full capacity, but the lower variable—below 10% of capacity—was equally important to keep humidity low at night and during week ends."

If your client's building or remodeling plans include air conditioning, why not call in an American Blower representative at the *planning* stage? American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

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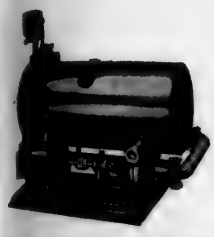
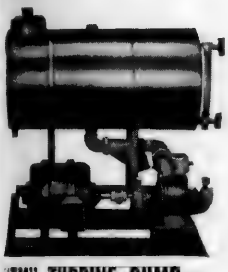


"HS" CONDENSATE PUMP



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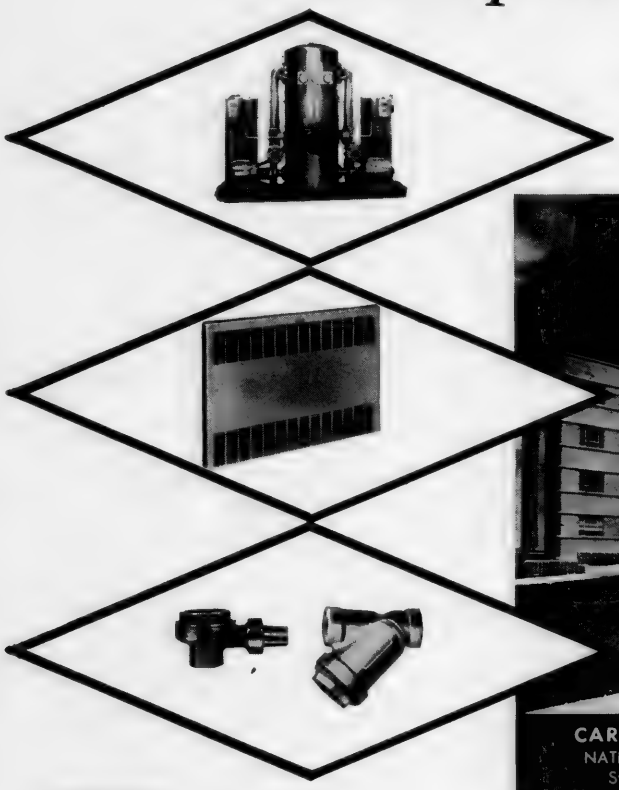

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VRDA15 Duplex Vacuum Pump
CH2030 Duplex Condensation Pump
CH3030 Duplex Condensation Pump
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Type 'R' Recessed Cabinet Convectors
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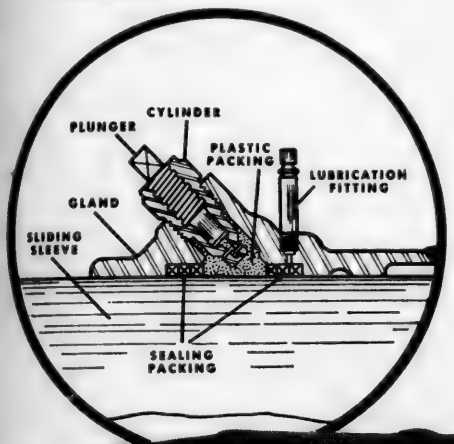
new savings
for expansion joint users

Cross-section of Gun-Pakt feature. To add packing, just add a plug and turn the plunger.



The Yarway Type W Gun-Pakt Expansion Joint has an improved one-piece design of body and gland and improved method of packing that provide new maintenance economies and greater operating efficiency.

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For full description, write for new Yarway Bulletin EJ-1916.

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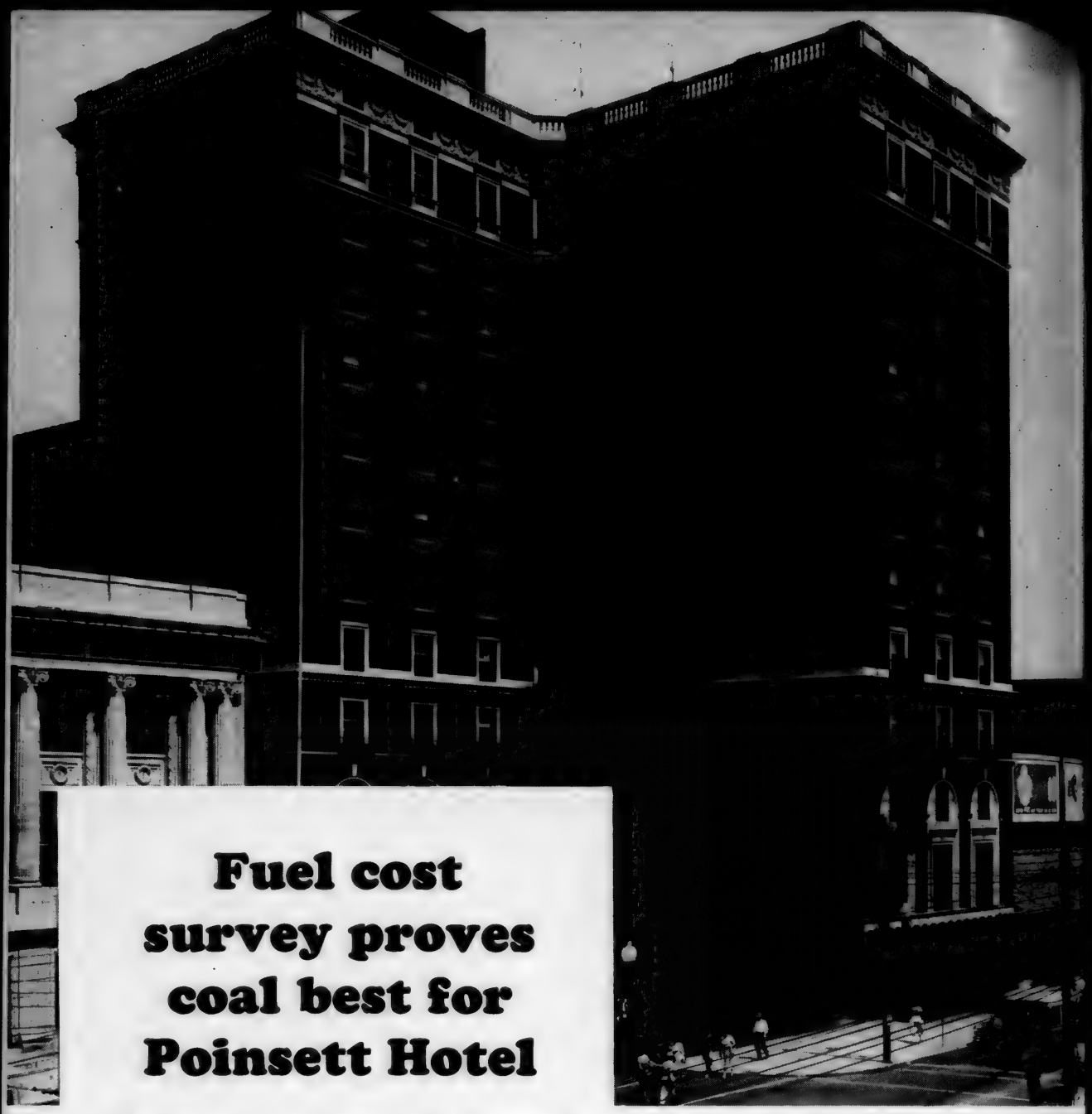

Fuel cost survey proves coal best for Poinsett Hotel

The Poinsett Hotel, Greenville, S.C., recently decided to increase steam capacity by adding a new boiler in its power plant. At the time, management asked its consultants, The McPherson Company, of Greenville, to analyze costs of all three types of fuel available in that area. On the basis of cost per thousand pounds of steam, the other two fuels proved to cost 25% more than bituminous coal. According to The McPherson Company, "The net result of this study indicated that by continuing with the use of bituminous coal the owners would save on both the initial investment and on operating costs."

For additional case histories on burning coal the modern way or for technical advisory service, write to the address below.

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facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum • Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

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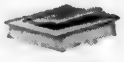

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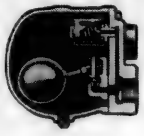

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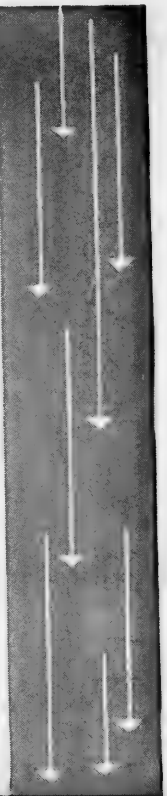

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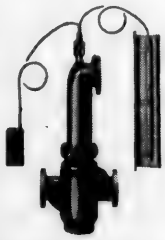
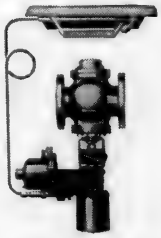


Modulating Controls for hot water and radiant heating



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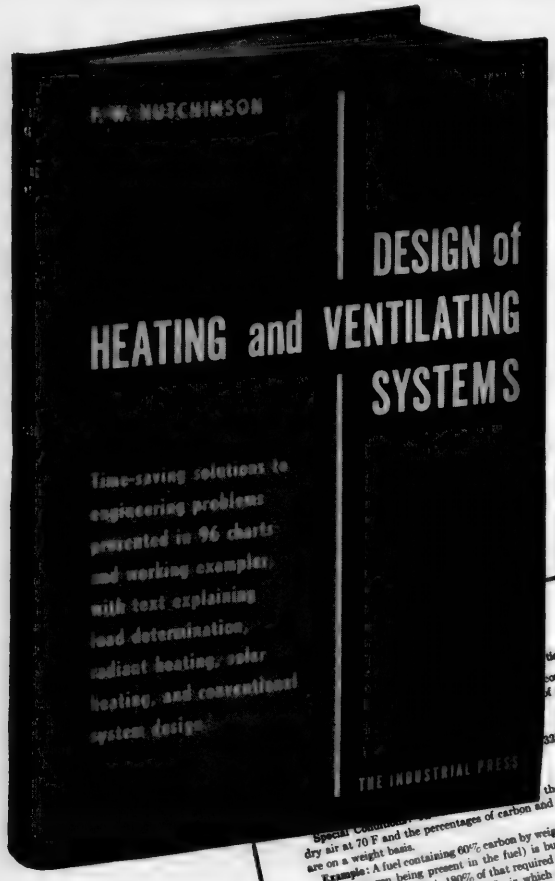
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Time-saving solutions to engineering problems presented in 96 charts and working examples, with text explaining load determination, radiant heating, solar heating, and conventional system design
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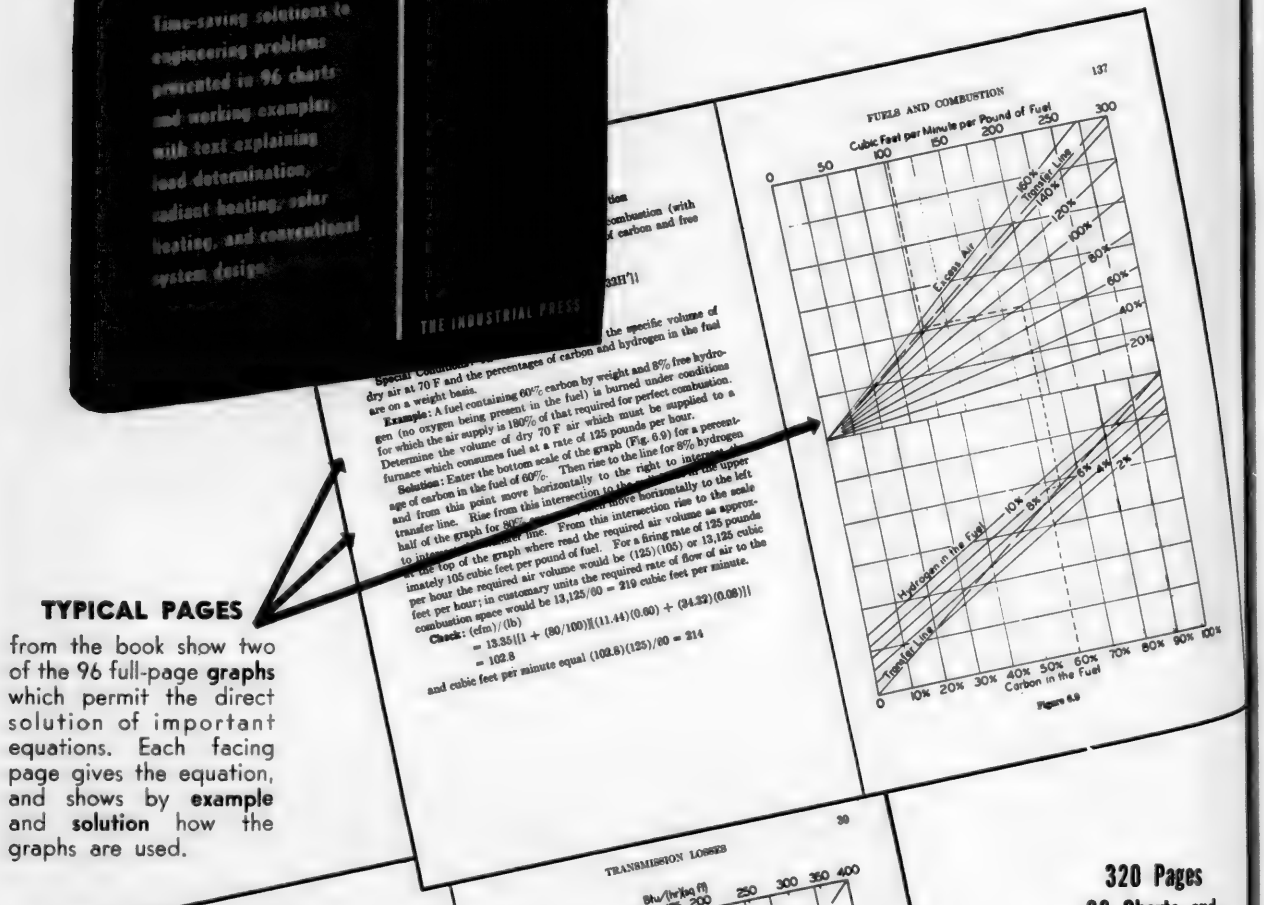
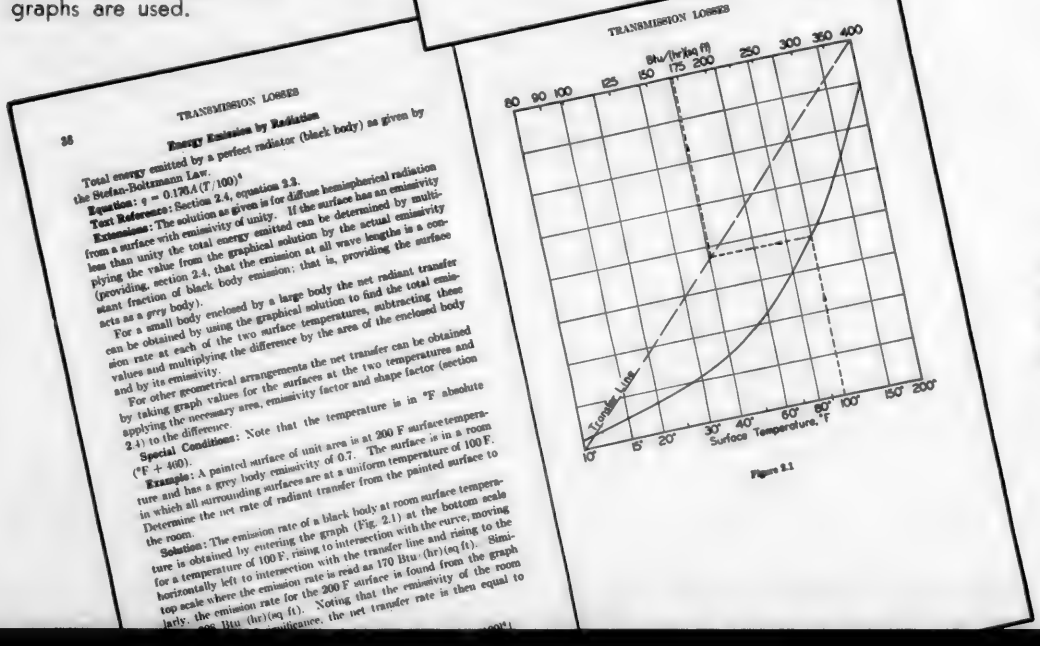
TYPICAL PAGES from the book show two of the 96 full-page **graphs** which permit the direct solution of important equations. Each facing page gives the equation, and shows by **example** and **solution** how the graphs are used.




TRANSMISSION LOSSES
38
Energy Emission by Radiation
Total energy emitted by a perfect radiator (black body) as given by the Stefan-Boltzmann Law.
Equation: q = 0.1714 (T/100)⁴
Text Reference: Section 2.4, equation 2.3.
Extensions: The solution as given is for diffuse hemispherical radiation from a surface with emissivity of unity. If the surface has an emissivity less than unity the total energy emitted can be determined by multiplying the value from the graphical solution by the actual emissivity (providing, section 2.4, that the emission at all wave lengths is a constant fraction of black body emission; that is, providing the surface acts as a grey body).
For a small body enclosed by a large body the net radiant transfer can be obtained by using the graphical solution to find the total emission rate at each of the two surface temperatures, subtracting these values and multiplying the difference by the area of the enclosed body and by its emissivity.
For other geometrical arrangements the net transfer can be obtained by taking graph values for the surfaces at the two temperatures and applying the necessary area, emissivity factor and shape factor (section 2.4) to the difference.
Special Conditions: Note that the temperature is in °F absolute (°F + 460).
Example: A painted surface of unit area is at 200 F surface temperature and has a grey body emissivity of 0.7. The surface is in a room in which all surrounding surfaces are at a uniform temperature of 100 F. Determine the net rate of radiant transfer from the painted surface to the room.
Solution: The emission rate of a black body at room surface temperature is obtained by entering the graph (Fig. 2.1) at the bottom scale for a temperature of 100 F, rising to intersection with the curve, moving horizontally left to intersection with the transfer line and rising to the top scale where the emission rate is read as 170 Btu/(hr)(sq ft). Similarly, the emission rate for the 200 F surface is found from the graph as 295 Btu (hr)(sq ft). Noting that the emissivity of the room
TRANSMISSION LOSSES
39
Btu/(hr)(sq ft)
60 90 100 125 150 175 200 250 300 350 400
Transfer Line
10° 15° 20° 30° 40° 60° 80° 100° 150° 200°
Surface Temperature, °F
Figure 2.1

320 Pages
96 Charts and Illustrations
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Heating and Ventilating Design Problems

If you are concerned with problems in the design of heating and ventilating systems, here is a book that will save you hours of time and, in addition, insure accurate calculations for many complex calculations.

You can solve problems involving load determination, duct design, panel heating, solar heating and combustion analysis *directly* by means of the 96 full-page working graphs which are an outstanding feature of the book. In many cases the use of these graphs will entirely eliminate calculation, while in others the graphs serve to minimize the arithmetical work needed in solving the equations. The scales used in constructing the graphs have been selected so that *the accuracy to which each graph can be read will equal or exceed the limits of accuracy of the equation from which it was derived.*

Opposite each graph is a design example and the solution illustrating the use of the method.

Explanatory text in each chapter clearly explains the engineering background and the mathematical basis of each graphical solution. Basic handbook data are also included so that, with the simple insertion of field data, design situations can be analyzed.

Another important feature of the book is the inclusion of complete data for systems designed to utilize partial solar heating through the use of large picture windows. This is the first text on heating to include engineering data on this increasingly important subject.

The author is Professor of Mechanical Engineering at the University of California. He is the author of "Industrial Heat Transfer" and co-author of a number of books on panel heating, refrigeration and air conditioning. His knowledge of the field is well grounded on practical experience as well as theory, as he acts as consultant for many industrial firms.

CONTENTS

Introduction
Load Determination: Transmission Losses
Load Determination: Intermittent Heating
Load Determination: Ventilating and Humidification
Load Determination: Losses from Ducts, Pipes and Tubes
Fuels and Combustion
Air Distribution
Conventional Heating System Design Procedure
Panel Heating Design Procedure
Solar Heating Design Procedure

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Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
437 WILSON, SO. NORWALK, CONN.

Industry shows in hotels provide problems in both air conditioning and ventilating.

Air Conditioning, Heating and Ventilating

Public Spaces in Large Hotels

FRANK S. STEIXNER
Building Superintendent, Commodore Hotel, New York, N. Y.

The uncertainty of heating loads and the wide variation of use for ballrooms and large meeting rooms in hotels, create interesting problems in the operation of air conditioning, heating and ventilating systems. Restaurants, stores and lobby also need careful operating attention.

MANY factors must be given careful consideration in the design, installation and operation of heating, air conditioning and ventilating systems for public rooms and areas in hotels. One must consider the many varied uses these rooms will be called to serve from time to time.

The picture is a complex one for within the category of public spaces must be considered restaurants, bars, ballrooms, meeting rooms and, of course, the hotel lobby. To add to the problems, such spaces as ballrooms can be put to a wide variety of uses—dinner-dances, industrial shows and meetings. Nor is that all. In addition to the factor of use, there are the physical aspects such as ceiling height of the public rooms, heat loads and exposures. While ceiling height is not a variable, heat loads and exposures may change from time to time.

Although the information presented in this article is general enough in character to apply to most large hotels, it is based on experience gained in operating the air conditioning, heating and ventilating systems installed in the Commodore Hotel.

Large Occupancies Are Common

As an example, take the larger type hotel which caters to conventions. In the case of the Commodore Hotel, the main ballroom measures 200 x 80 ft, has a ceiling height of nearly 30 ft, and a balcony arrangement consisting of 56 cubicles encircling the largest combination of public function rooms. All this may have an occupancy of over 2000 persons.

Frank S. Steixner, building superintendent, Commodore Hotel, New York, N. Y., for the past year, has had extensive experience in the mechanical operation of hotels and restaurants. For 10 years (2 as chief engineer) he was with Longchamps Restaurants, a company which then operated 12 restaurants in New York City. During the next 10 years he was chief engineer for the Savoy-Plaza Hotel, New York City. He taught a class in practical refrigeration at New York University, and is a member of ASRE.

Ventilating equipment to be provided for such service must have the ability and adaptability to perform properly under a wide range of conditions related to the type of function and the number of persons in the rooms. Of particular importance are the extremely heavy lighting loads with the additional heat loads imposed by display lighting, spotlights, theatrical lighting, heavy wattage dimmers, TV equipment, and other heat-producing equipment not connected with normal comfort heating.

Loads Change Rapidly

The ventilating and cooling systems must be flexible enough to cover short-time operational and functional changes. As an example, commencing at 6 a.m. we may set up for an exhibit of household items to display radios, television sets, electric cooking ranges, electric steam tables, hot plates and grills. At 9 a.m. when the exhibit is open to the general public, the total traffic flow entering and leaving the exhibits may be hundreds of persons per hour. There is such a sudden increase in heat load that the ventilation per person requirement may well impose and tax the ability and flexibility of the ventilation equipment. This same room may be completely cleared of these exhibits and crowds some time late in the afternoon so that the room will be available for a dinner, dance, lecture or a fashion show the same evening. The schedules are so arranged and often run so close that one may well compare such scheduling to a train dispatcher's problems in keeping the tracks clear and open, and the trains running to reach their destinations on time. Related problems, along with proper scheduling and clearing of the space and readying it for another use, includes the rapid air changes and control of extremes in temperatures that may be required.

Air Movement

With the combination of public rooms at the Commodore, in addition to the main ballroom, there are times when more than 1,000,000 cfm of air are delivered, washed, cleaned electrostatically, humidified and/or dehumidified, and distributed and/or exhausted. We have what is known as auxillary and booster fan operation for the heavier than normal peak load conditions. Fans generally are oversized. In some cases air is bypassed by manual dampers. The fans are of both the axial flow and radial flow design. Some fans are equipped with speed regulation controls; others are of constant speed and load design with auxiliary and booster fans hooked into the same system. It must be possible to have many more air changes per minute than the average space that is conditioned for comfort. Generally air velocities are lower than are provided for the average air conditioned space, and we must deliver heavier volumes of air.

Large registers with diffusing and directional grilles are generously provided throughout our air conditioned spaces. A casual examination of public rooms may indicate an apparent lack of grilles and air registers and outlets. They are there, nevertheless, hidden in lighting coves or blended in with decorative schemes.

Air Handling

Duct sizes must be more than adequate to deliver the desired air quantities required for a wide and changing range of conditions.

A positive pressure is maintained throughout all air conditioned spaces to allow a spillover of air to the non-air cooled kitchen and serving pantries serving the public rooms. This avoids kitchen odors from reaching and mixing with air in the conditioned spaces.

Smoke Problems in Bar Areas

One of the more serious ventilation problems in restaurants and hotel public rooms is the proper removal of cigarette smoke, and this is particularly acute at bar areas —more so at peak business periods and at cocktail time. The heavy occupancy with a high percentage of cigarette smokers requires a large number of air changes to maintain satisfactory air conditioning. Some engineers fail to allow that consumption of alcoholic beverages increases ones rate of metabolism so that even though the temperature at the bar may be maintained at ideal conditions, there will be complaints, after one has had a few drinks, that the room is too warm. We must therefore deliver greater quantities of air to bar areas, keeping velocities down to avoid drafts, and provide special smoke exhausts over the bar areas.

Our main bar is said to be the largest of any hotel in the country. There is a large concentration of patrons just before the commuter rushes for his train. However, there has been no operation problem because of the special attention that was given to proper ventilation for this area. The design included a special smoke exhaust system for the bar area which has a smoke exhaust fan which is operated during extremely heavy peak loads.

Under conditions of rapid changes in numbers of patrons and quick turnover, it is essential that controls be so installed that the equipment is flexible for light, medium, heavy and peak load operations.

Hotel Lobbies

Large hotel lobbies have inherent problems not found in ordinary commercial buildings. These include the wide expanse of space, the high ceilings and the varying flow of human traffic. In addition, most front office accounting and cashier departments, are spaces partitioned from the main lobby and require special design considerations to provide comfort for the office staff.

Large hotel lobbies generally have a perimeter of stores of various occupancies. Some stores are air conditioned, others are not. Static pressures in these stores will vary considerably, depending upon the exposure of the store's street entrance and the second door opening on the lobby.

Natural stack action must be taken into consideration,

as this will affect the balance and distribution of cooled or heated air to a large lobby. A large bank of elevators, all with landings at lobby and mezzanine levels, will sometimes interfere with lobby ventilation. Proper planning is required to avoid such problems that may develop. During average conditions, an appreciable number of hotel patrons continuously come and go through the lobby and stores.

Our lobby has direct underground access with Grand Central, a station of the New York subway system; a street connected arcade; and other buildings and stores of every description, with hotel restaurants in our lower lobby. Some special problems occur from time to time due to seasonal weather changes and unusual wind conditions. Higher than normal static pressures are maintained, to avoid back drafts from the various areas into the hotel's independently air conditioned spaces.

Hotel lobbies certainly do not have a constant ventilating and air conditioning load. Normal traffic and occupancy can be seriously changed by the hundreds of guests checking in for a convention. Soon the entire lobby, as one views it from the mezzanine, is milling humanity until the strain is relieved by the opening of convention meetings. This brief maximum use of the lobby space, calls for special ventilation and air conditioning.

Industry Shows

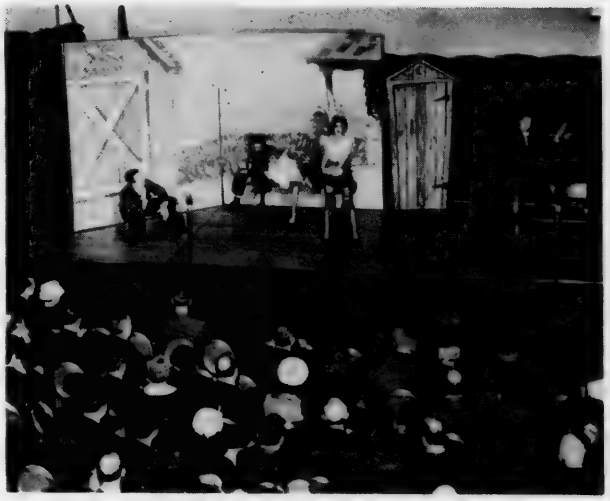
Many of the larger hotels are finding a lucrative business in renting space for style shows, commercial exhibits of household goods, industrial machines, automotive and aeronautical displays. In many cases these presentations or exhibits are actually theatrical productions which require proper lighting and settings. Heavy air conditioning loads are imposed by the extra illumination and spotlights used. There is also the heat gain from the audience —in some cases seated and in other cases the spectators are moving about. Drafts will result if air is not delivered at proper velocities and temperature conditions. Sound level must be held down in the duct work so that speakers addressing groups may be heard without difficulty.

Industrial shows in hotels, sometimes as part of a convention or as a separate venture, are growing in number and also in size. As an example, a recent exhibit of airplane jet engines and component parts required the setting up of dozens of separate booths, each partitioned and screened from the others. This may present the problem of providing adequate air circulation to maintain human comfort. Large fashion shows or dinner dances with stage type entertainment, may call for backdrops and stage settings. Oversize advertising banners are often suspended from ceilings and balconies. All of these temporary installations may interfere with ventilation if forethought is not given to the size and location of discharge and return grilles.

Controls

Ventilation of the individual systems throughout the building is automatically controlled thermostatically.

Heating and ventilating requirements vary so widely that full dependence upon automatic controls would not do a good enough job. There are specially trained men from our maintenance department, known as air conditioning and ventilating men, whose responsibility it is to see that proper conditions are maintained throughout the public rooms. They must frequently step in to augment the control system which, however good it may be in operation, requires personal attention in checking and resetting of controls as the situation may demand. While some complaints are apt to be registered from time to time, these men anticipate sudden and drastic changes in occupancies which will adversely effect a given area and will take whatever steps are necessary to prevent a call for correction. The air conditioning men circulate among the exhibits and are generally available in the show area to handle any request for a temperature or ventilation adjustment.



Shows have large attendances and cause a large cooling load.

When adjustments are called for and made, the air conditioning man will notify the engine room, to keep the watch engineer posted on any changes that will affect the refrigeration cycle or the heating equipment. Temperature recording charts have been wisely provided in the multiple air conditioning systems. These have proven a valuable aid in maintaining satisfactory comfort conditions.

Toilets and Rest Rooms

Rest rooms and toilets have ventilating equipment to provide for a needed 12 to 14 air changes per hour. Generally, fresh air supplied comes from other air conditioned spaces and is pumped into toilet rooms. A positive exhaust is run continuously and a slight negative pressure is maintained within the space to prevent any possible leakage to other occupied adjoining areas. A good movement of air is necessary for proper ventilation. Exhaust grilles are generally located in the ceiling over each pair of partitioned booths. In those installations where a portion of cooled air for public rooms is directed to the ventilation of toilets, one advantage is realized in that the air thus supplied is cooler and lower in moisture content than if outside air were drawn in without treatment for toilet ventilation.

It can now be appreciated that the public spaces of hotels present the summation of conditions found in a number of separate commercial applications.

Can You Become a Rapid Reader?

KENNETH GABLIN
Sales Engineer, The Trane Company, La Crosse, Wis.

DO you read so slowly during the day that you find yourself taking work home at night? If you do, it can be cured with a little extra effort on your part during the day or during your few minutes with the evening paper.

Since reading has become an important part of the engineers' average working day, testing of these men has come up with one shocking statement: Most engineers read at an average rate of 250 words per minute. Moreover, only 70 to 75% of the words read respond to the mind as comprehension. If you have a child in the seventh grade, chances are that he is a better reader than you are.

You may try the easy way out and rationalize that as an engineer, you read things for content, not speed, and it is impossible to change your habits. Anyway, you note, they are too firmly entrenched to try to change them now.

In reality, upon close examination of the following faults that slow the reader, you will notice that reading the technical paper with a pencil and pad on your desk is not one of them.

Here are the common faults in order of seriousness:

1. The *Lip Reader*—a person who reads with his lips at an average rate of 125 words per minute.

2. The *Throat Mover*—a person who vocalizes his words at an average rate of 175 words per minute.

3. The *Echo Chamber*—a person who hears the words he reads in his own mind.

4. The *One Lunger*—a person who reads word by word.

5. The *Tennis Game Watcher*—a person who swings his head from side to side as he reads.

6. The *Windshield Wiper*—a person who follows the words with his finger.

7. The *No Shifter*—a person who reads all publications at the same rate.

These faults are of a mechanical nature and seem to be the ones that plague the engineer most.

Similarly, mental faults are due to a general lack of vocabulary, a passive interest, and day dreaming while reading.

Some of this difficulty can be overcome by examining the type of material to be read. For example, the lead or first paragraph of a newspaper story usually contains the gist of the entire article, while the intermediate portion of the body of a business letter normally contains this information.

Suggestions for increasing reading rate are:

1. *Read phrases, not words.* This is analogous to tiptoeing when you could have been running.

2. *Go forward only.* Do not use reverse gear and regress over material that has already been read. This habit discontinues your chain of thought and therefore slows down the reading time.

3. *Have an incentive.* Place a watch by your chair for the first few weeks and make a habit of reading some material daily that has a consistent number of words per page. A normal digest size contains about 500 words. Try reading a page in one minute. Most normal size magazines average out around 800 words per page. A two-minute average per page is a good beginning. At this rate, you are about to break the sonic barrier which keeps you from hearing the words as they are read.

As you progress into the range from 500 to 1000 words per minute, you are entrenching on the hallowed ground of the trained reader who reads average material at 700 words or more per minute.

Improvement seems to come rapidly during training periods when groups improve from 250 to 450 or 500 words per minute.

The other factor in speed-reading is comprehension. Most people are erroneous in their conception that speed decreases their comprehension. Actually, this rate increases slightly due to the increased concentration on the material. The over-all advantage of speed-reading is increased reading efficiency, which is a measure of the product of the speed and per cent comprehension. It is called index of efficiency. Thus, in our initial example, the index was 175 based on 250 words per minute and 70% comprehension. If you are only an average reader, chances are that your index will more than double if you only improve to the level of 500 words per minute and 75% comprehension.

Basic speed-reading courses have been utilized by many large concerns for the benefit of the engineers.

Air Conditioned Sidewalk Zones for Shoppers

A shopping center in Omaha, Neb., has indoor sidewalks that are heated in winter and air conditioned in summer. This shopping area includes 40 stores under one roof, arranged in three levels so that customers may drive to any level to park their cars and shop. Total parking space available is sufficient for 1,700 cars.

By combining heating and air conditioning, important economies were effected. The main tenant, a department store, occupies approximately half of the 200,000 sq ft sales area. Younker's has its own 300-ton chilled water plant. The smaller stores, however, have individual packaged air conditioners, which also include coils for hot water. During the winter the stores are heated through the same units that keep them cool in the summer.

Two 175 hp packaged York-Shipley hot water generators serve the individual air handling units, a fin tube along the exterior wall, unit heaters at the entrances and a large radiant floor panel of approximately 23,000 sq ft in the floor area that overhangs a parking lot. Generators are convertible from No. 3 fuel oil to gas firing.

Calculating the Heat Requirements of a Snow Melting System

Part 11 Central Atlantic Coast Region

WILLIAM P. CHAPMAN

This is the eleventh article in a series of twelve which has covered all parts of the U.S. where snow melting systems are likely to be used. The first article summarized the basic equation for heat required for snow melting and defined the free area ratio as the ratio of slab area free of snow to total slab area. In order that each installment of this series can be understood, both the classification of systems and an explanation of the four tables are repeated.

THE total heat output of snow melting system depends on the rate at which it melts the snow, and this rate in turn depends on the relative importance of rapid snow removal among the different types of applications. Snow melting systems can be classified as follows:

Class I (minimum): Residential walks or driveways and interplant areaways;

Class II (moderate): Commercial (stores and offices) sidewalks and driveways and steps of hospitals; and

Class III (maximum): Toll plazas of highways and bridges, and aprons and loading areas of airports.

These classifications depend upon the allowable rate of snow melting. For example, a residential system does not have to melt snow as rapidly as a commercial system. In fact, a depth of snow of an inch for an hour or so during a heavy storm might not be objectionable with a residential system. On the other hand, a store manager would claim the system was inadequate if half an inch accumulated on the sidewalk in front of his store. The difference, then, between a Class I system and a Class II system is in the ability of each system to melt snow. The one feature that is common to all classes is that the systems must be adequate for some combination of weather factors. Or, the designer wants to be able to say that he will pay to melt snow whenever conditions are milder than some critical value but he is willing to have an inadequate system for a given fraction of the time. In other words, the designer will run a calculated risk providing he knows the odds of that risk. For a residential system, where initial cost must be at a minimum, the designer must accept more frequent snow accumulations.

Naturally, the owner is not concerned about an explanation of why there is an accumulation of snow on

the sidewalk. It is immaterial whether the accumulation is due to excessive snowfall or whether it is due to an extremely cold snowfall. In both cases, the ultimate reason is that an inadequate flow of heat is reaching the surface. The true analysis of heat output, then, depends on an analysis of the weather. This is true of all three classes.

The total heat requirements of a snow melting system are determined, therefore, by (a) the total area of the snow melting slab, (b) the rate at which the snow is to be removed, and (c) the values and frequency distribution of each of the pertinent climatic variable (humidity, wind, temperature, and snowfall). Obvious (c) varies from city to city and, due to the complexity and number of calculations to obtain a frequency distribution of the four variables, the evaluation of (c) has been virtually impossible. However, by the use of punched cards and statistical tabulating machines, data has been derived so that the heat requirements for a given city can be simply presented.

The designer needs two types of information. First, the most severe combinations of variables on which to base his *design output*, and second, the heat required over the season so that *operating costs* can be determined. These data are given in Tables 1, 2, 3, and 4 which follow and which cover three cities in the Central Atlantic Coast region of the U. S.

Table 1

The first table gives some generalized information on snowfall and snow on the ground. The next to last item, "Greatest dept of snow on the ground" indicates the greatest depth to which snowfall has ever accumulated. Other items are self-explanatory.

Table 2

Table 2 contains the operating information of a snow melting system. For freezing temperatures (32 deg and below) but no snowfall the system may be "idling." That is, the designer may want to supply some heat to the slab so that there will be immediate melting when snow starts to fall. The column on mean temperature gives the average temperature during *freezing* temperatures. This temperature is used in calculating the "idling" load. The other term needed to calculate idling load is the wind velocity during the period of freezing temperatures.

TABLE I—GENERAL INFORMATION ON SNOWFALL, CENTRAL ATLANTIC COAST REGION

Item	New York, N. Y.	Philadelphia, Pa.	Washington, D. C.
Approximate mean number of days with an inch or more of snow on the ground	35	35	30
Average number of inches of snowfall per year	30.9	21.5	19.9
Greatest snowfall in 24 hours, inches	25.8	21.0	25.0
Greatest depth of snow on the ground, inches	24.0*	26.0	34.2
Mean number of days per year with snowfall of 1 inch or more	8	6	6

* From "Snow Melting" by T. Napier Adlam, The Industrial Press.

The column "Hours of Snowfall" indicates the number of hours that snow is falling at rates equal to or greater than 0.01 inch of water equivalent per hour. Roughly speaking there are snowfalls of "trace" quantities about twice as often as there are for measurable quantities of 0.01 inch or more. It is assumed that these light falls can be handled by the idling load.

The remaining columns of Table 2 represent the frequency distribution of required heat output. This distribution is based on the solution to the basic equation for two values of the free area ratio A_r. This distribution represents the heart of the analysis and is also the basis for Tables 3 and 4.

Table 3

Table 3 contains the *design* heat requirement—as explained in the footnotes to Table 3. These design rates may be altered by the designer if he feels that a particular job should have a different design criterion from those given in the footnote. Any change in design selection should be based on the frequency distribution given in Table 2.

Table 4

Table 4 contains the data required to estimate the operating cost of a snow melting system. The footnotes to Table 4 explain the various items.

Use of the Tables

Example.—You are a consulting engineer that has been retained by the city of New York to design a snow melting system for a municipal parking garage. There will be ramps for automobile traffic and also sidewalks for pedestrian traffic.

You have decided to use an output of 250 Btu per (hr) (sq ft). To justify your selection—since Table 3 indicates at least 298 Btu per (hr) (sq ft) for such an installation—you would like to illustrate the operation of your system during New York City's worst snowstorm, the one of December, 1947.

Table A lists the climatic factors influencing snow melting system operation for the December, 1947, snow storm. Listed in addition are the required outputs for free area ratios of 1.0, 0.5, and 0.0.

A light snow started to fall at 4:00 a.m. on December 26, 1947. At first the load was very light—only 47 Btu per (hr) (sq ft) for a free area ratio of 1.0. By noon, however, over 10 inches had fallen and the load was up to 207 for $A_r = 1$ and 160 for $A_r = 0$. This still would not overload a system capable of delivering 250 Btu per (hr) (sq ft). The load increased somewhat at 1:00 p.m., and then from 2:00 to 4:00 p.m. it decreased again. The decrease, however, was not enough to allow much heat storage for a system operating at 250 Btu per (hr) (sq ft). If the system were controlled so that the surface temperature remained at 33 deg F, then of course there would never be any heat storage. Let us assume that your system has such a control device.

At 4:00 p.m. the load was up to 298 Btu per (hr) (sq ft) for $A_r = 0$ which is a 48 Btu per (hr) (sq ft) overload. At a snowfall rate of $S = 0.39$ and a temperature of 26 deg F, such an overload would leave a residue of snow on the slab of about 0.7 inches. At 5:00 p.m. the load was down to 205 for $A_r = 0$, hence there is a surplus of 45 Btu per (hr) (sq ft). This surplus

TABLE A—CLIMATOLOGICAL DATA AND REQUIRED HEAT OUTPUT FOR THE STORM OF DEC. 26 AND 27, 1947, NEW YORK CITY.

Time	Snowfall Inches of Water Equiv.	Air Temp. Deg F	Relative Humidity %	Wind Velocity Mph	Required Output, q_0 ($A_r = 0$)	Required Output, q_1 ($A_r = 1$)	Required Output, $q_{0.5}$ ($A_r = 0.5$)
4 am	.01	29	67	13	8	47	28
5	.02	29	85	15	15	51	33
6	.06	25	93	15	46	101	74
7	.09	24	100	17	69	134	102
8	.14	26	90	11	107	147	127
9	.15	28	89	14	114	151	132
10	.15	29	90	15	113	146	130
11	.20	30	87	13	151	175	163
12	.21	27	95	17	160	207	184
1 pm	.22	26	97	22	168	233	201
2	.19	26	94	23	145	216	181
3	.16	25	96	26	123	211	167
4	.39	26	91	28	298	385	342
5	.27	28	93	32	205	277	241
6	.16	29	94	31	121	177	149
7	.09	29	94	33	68	129	98
8	.05	29	95	31	38	94	66
9	.02	29	95	33	15	74	45
10	.01	29	95	30	8	62	35
11	.01	29	94	27	8	58	33
12	.01	29	95	28	8	58	33
1 am	.02	29	95	34	15	76	45
2	.03	28	94	36	23	102	63
3	.01	28	97	36	8	83	45

will just about melt the snow accumulated during the previous hour.

It may be said then that with an output of 250 Btu per (hr) (sq ft) the free area ratio would drop to zero for the two hours of 4:00 and 5:00 p.m., but would rise to 1 by 6:00 p.m. Also it may be said that with an output of 250 the free area ratio would have been 1.0 for 22 of the 24 hours of the record storm. From Table 2, it can be seen that an output of 250 would maintain a free area ratio of 1.0 for exactly 98% of the cases. Such a performance certainly seems adequate for a commercial application similar to the municipal garage cited here. In fact, if it were not for the occasional heavy storm that sweeps in on this region, the design rates shown in Table 3 could be reduced about 20%.

Central Atlantic Coast Region

As the name implies, the Central Atlantic Coast Region lies along the Atlantic Coast between Connecticut and North Carolina. The region extends west from the Atlantic Coast to the Appalachian Mountains (the Susquehanna River in the north), and south from the 42nd deg parallel to the James River in Virginia. The three cities chosen to represent this area are New York, Philadelphia and Washington. All three of these cities lie on the Atlantic Coastal Plain, and the entire region, except for the area northeast of Philadelphia, is relatively flat.

This region is affected climatically by the Atlantic Ocean, but most of the weather conditions are the results of the prevailing winds coming from a westerly direction. For that reason the weather is more nearly continental than maritime in nature. The prevailing winter wind is from the northwest in all three cities. This plus the moderating effect of the ocean develops a remarkably similar winter climate for the 3 cities in this region.

The average temperature, degree days, and precipitation shown in Table B illustrate the similarity of the weather conditions for the three cities for the five winter months, November to March. As one would expect, Philadelphia represents a compromise between New York City and Washington.

In February, 1934, the temperature dropped to —14 deg F in New York City, but normally the temperature reaches zero only once a year. About 90 days per year have minimum temperatures of 32 deg or below; only 22 days per year have maximum temperatures 32 deg or below. With an average winter temperature of 37.7 deg it is somewhat surprising that snow is on the ground 35 days per year. The snow season in New York starts in December and ends about the middle of March. About one-third of the total snow falls in February, so one can say that the snow season is quite late. The annual average snowfall is 30.9 inches but in February, 1894, there was a fall of 37.9 inches and in the winter of 1947-48 the total was 61.5 inches. About three or four times a year a snowfall of three or more inches can be expected and about once a year a fall of at least seven inches can be expected. In a city like New York a snowfall in excess of three inches represents a real nuisance.

In Philadelphia there is less snowfall than in New York; however, occasional storms are about as severe as those in New York. For example the maximum fall in 24 hours was 25.8 inches in New York City and 21.0 inches in Philadelphia. In addition, the snow stays on the ground about as long in Philadelphia as in New York —about 35 days per year for each city. The Weather Bureau does report, though, that there is considerable

TABLE B—AVERAGE WEATHER CONDITIONS FOR THE FIVE WINTER MONTHS, NOVEMBER THROUGH MARCH

City	Avg. Temp. Deg F	Degree Days	Precipitation Inches
New York City	37.7	4113	15.7
Philadelphia	39.7	3809	15.6
Washington, D. C. ..	41.2	3601	15.0

TABLE 2—DATA FOR DETERMINING OPERATING CHARACTERISTICS OF SNOW MELTING SYSTEMS IN THE CENTRAL ATLANTIC COAST[1]

Period of No Snowfall

City	Air Temperature, Deg. F[2]			Wind Velocity, Freezing Period,[6] mph
	Over 32	Below or Equal to 32	Mean Temperature During Freezing Period[6]	
	Percent of Winter Hours with No Snow at Above Temperatures			
New York, N. Y.	55.7	42.2	24.2	11.8
Philadelphia, Pa.	75.8	22.6	26.7	9.7
Washington, D. C.	77.9	21.2	26.8	9.6

Period of Snowfall[3]

City	Hours of Snowfall[3]		Free Area Ratio, A_r	Required Output, Btu per Sq. Ft. per Hr.[4]									Maximum Output, Btu per Sq. Ft. per Hr.
	Percent	Hr. per Year		0–49	50–99	100–149	150–199	200–249	250–299	300–349	350–399	400–up	
				Frequency Distribution of Snowfall Hours at Above Outputs Percent[5]									
New York, N. Y.	2.1	76	1	53.1	31.8	9.4	2.2	1.5	1.7	—	0.3	—	385
			0	87.6	9.6	1.5	0.7	0.3	0.3	—	—	—	298
Philadelphia, Pa.	1.6	58	1	62.3	23.6	10.4	2.3	0.9	0.5	—	—	—	296
			0	84.3	14.0	1.1	0.2	0.4	—	—	—	—	229
Washington, D. C.	0.9	33	1	59.0	29.8	10.6	0.6	—	—	—	—	—	154
			0	85.7	11.8	2.5	—	—	—	—	—	—	121

[1] The period covered by this table is from Nov. 1 to March 31, incl., with February taken as a 28¼ day month. Total hours in period = 3630.
[2] The percentage in Columns 2 and 3 plus the percent under hours of snowfall total 100%. Note that "Hours of Snowfall" does not include idling time, and is not actual operating time. See text.
[3] Snowfalls of trace amounts are not included; hence, "Hours of Snowfall" includes only those hours of 0.01 inches water equivalent per hour snowfall.
[4] Output does not include allowance for back or edge losses since these depend on slab construction.
[5] Percentages total 100% of the number of hours of snowfall.
[6] "Freezing Period" is that during No Snowfall when the air temperature is 32 deg or below.

variation in the pattern of snow in various parts of the city. The snowfall in the northern suburbs particularly is greater than in the central part of the city. In general the snowfalls are not particularly heavy. Single storms of 10 inches or more have occurred only 12 times in Philadelphia since 1884.

The coldest temperature on record in Philadelphia is —11 deg F and occurred in February, 1934. About once each year the temperature drops to zero or below. The average year will have 76 days with minimum temperatures equal to or less than freezing, and 21 of the 76 occur in January. Although January is the coldest month with an average temperature of 34.9 deg, February has the most snow, 6.7 inches. In January, 1918, there was a fall of 27.0 inches. This is the maximum for a single month; the annual maximum was 43.8 inches and occurred in the winter of 1904-05.

Washington, D. C., the southernmost city in the Central Atlantic Region has the mildest winter and the least snowfall of the three cities studied in this region. The coldest weather occurs in late January and early February. January has a mean monthly temperature of 36.5 deg and February 37.5 deg. A minimum of zero is rare, but freezing temperatures are registered on the average of 82 days per year (as compared to 76 in Philadelphia and 90 in New York City). The record low was —15 deg on February 11, 1899, just preceding the worst blizzard in Washington's climatic record.

The 1899 blizzard brought 20.5 inches of snow and for that month the total snowfall was 35.2 inches. In January, 1922, however, in one 24 hour period the fall was 25.0 inches with 31.5 inches for the month and 44.5 inches for the winter. The average annual snowfall is 19.9 inches.

The storm of January, 1922, is known as the Knickerbocker Storm because the snowfall accumulation on the roof of the Knickerbocker Theatre caused the collapse of the roof with the resultant loss of many lives. The fall in the entire storm was 28.0 inches and 25.0 inches fell in just 24 hours. Snow started to fall at 4:20 p.m. on the 27th and continued until 12:30 a.m. on the 29th. There was five inches of snow on the ground at 8:00 p.m. on

TABLE 3—DESIGN DATA FOR SNOW MELTING SYSTEMS, CENTRAL ATLANTIC REGION

City	Design Output, Btu per (Hour) (Sq Ft)		
	Class I System[1]	Class II System[2]	Class III System[3]
New York, N. Y.	121	298	342
Philadelphia, Pa.	97	229	263
Washington, D. C.	117	121	144

[1] For Class (residential) Systems, the design output is set at that required heat output (see Table 2) when $A_r = 0$ at the 98th percentile of the frequency distribution; that is, where 98% of the hours have this output or less.
[2] For Class II (commercial) Systems, the design output is the maximum output when $A_r = 0$ in Table 2 (last column).
[3] For Class III (industrial) Systems, the design output is determined by the following four requirements: (1) Output is never exceeded for two consecutive hours; (2) Output for $A_r = 1$; Table 2, is at least 1 Btu per hour per sq ft greater than maximum output for $A_r = 0$; (3) A_r is greater than or equal to 0.5 the maximum requirement shown in Table 2 for $A_r = 1$. That is $q_d = q_s + q_m + 0.5\ (q_e + q_h)$ for the conditions where $q_t = q_s + q_m + q_h + q_e$ are a maximum; (4) The free area ratio A_r is unity for at least 98% of the hours listed in Table 2.

TABLE 4—YEARLY OPERATING DATA, CENTRAL ATLANTIC COAST REGION

City	Idling			Melting		
	Time,[1] Hr. per Year	Rate,[2] Btu per (Hour) (Sq. Ft.)	Output,[3] Btu per (Year) (Sq. Ft.)	Time,[4] Hr. per Year	Class[5]	Output[6] Btu per (Year) (Sq. Ft.)
New York, N. Y.	1532	50.7	77,700	76	I	4180
					II	4690
					III	4710
Philadelphia, Pa.	820	31.4	25,700	58	I	2710
					II	3100
					III	3110
Washington, D. C.	770	30.6	23,600	33	I	1650
					II	1660
					III	1690

[1] From Table 2. Column 3 × 3630 (hr per year).
[2] Rate when idling, Btu per (Hr) (Sq Ft) = (0.27V + 3.3) (32 — t), where V = wind velocity from Column 5, Table 2, and t = air temperature from Column 4, Table 2.
[3] Product of the two preceding columns.
[4] Hours of Snowfall, from Column 7, Table 2.
[5] See footnote for Table 3.
[6] Based on the condition that surface temperature is maintained at 33 deg until required output exceeds design output, at which time design output is used regardless of required output. Distribution of required output based on Table 2.

the 27th and four hours later the depth was nine inches. In the next 14 hours the depth increased 16 inches, but then the storm slackened off and only three inches accumulated in the last 10 hours. The 28.0 inches of snow is recorded as 2.49 inches of water equivalent. Certainly this storm would have caused confusion in any city, and in fact, had a greater fall in 24 hours than all but one of the worst storms reported for the 33 cities covered in this series. The one exception is the storm of December, 1947, reported in New York City as 25.8 inches.

From Table 2, the market for snow melting in this region might seem discouraging. In New York City snowfall occurs only 76 hours per year and the maximum output even for a free area ratio of zero is 298 Btu per (hr) (sq ft). On the other hand, from experience we know that the operating time is at least three times the actual hours of snowfall, which represents about 230 hours per year or about 6% of the winter hours. In addition, the distribution shown in Table 2 indicates that an output of 250 Btu per (hr) (sq ft) would maintain a free area ratio of unity for 98% of the cases. In Table 3, though, New York City is listed for 298 Btu per (hr) (sq ft) for a Class II design rate.

It is a characteristic of this region that violent storms occur occasionally. As a result, the designer should make allowances for these possibilities when selecting his equipment. These storms occur just often enough that snow melting has become quite popular in Manhattan. Very often systems in New York City are in sidewalks around large office buildings, which are heated by purchased steam. By subcooling the condensate of the steam in a heat exchanger for the snow melting system, the operating cost could be reduced to a negligible amount. In fact a fluid temperature of 135 deg F would satisfy 96.5% of the cases shown in Table 2 (see "Design Conditions for Snow Melting" by William P. Chapman, Heating and Ventilating, November, 1952).

Since accumulated snow is such a nuisance in congested areas, and since operating costs can be reduced to very low amounts, snow melting systems are practical in New York City. In Philadelphia there seems less justification, and in Washington, very little justification for snow melting systems. It can be said then, that the snow melting potential varies from attractive to slight as one goes from the northern to the southern boundaries of the Central Atlantic Coast Region.

Time Function Control for Air Conditioning, Heating, and Ventilating Systems

Time function control systems for use with various types of air conditioning, heating, and ventilating systems was the subject of a talk presented by Joseph E. Leininger of the consulting engineering firm of Joseph E. Leininger and Associates, New Orleans, La., to the New Orleans Section of American Society of Refrigerating Engineers.

In many small buildings, control of the facilities, as desired by the occupants, is provided simply by a manual *on-off* switch. In others, time control may be provided by means of a synchronous motor operated timing device with or without features to set up a simple program for system operation.

However, in larger buildings where various air conditioning, heating, and ventilating components are frequently located at considerable distances from a desired central control point, the establishment of programmed control becomes more complicated. Unless proper means of controlling the operating schedules of each component are included, operational difficulties, both costly and troublesome, may be experienced. Aside from automatic programming, integrated features of time function systems, such as remote control and visual indication of the operational status of facilities, can be and often are of primary importance. These types of control systems are not to be confused with temperature and humidity control systems.

Mr. Leininger described in detail types, components, and applications of central control systems. His talk was printed by and is available from Time Equipment Div., International Business Machines Corp., New York, N. Y.

Potential Error in Use of a Vertical Manometer

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Vertical water manometers used to calibrate other manometers contain a source of potential error which is here described and evaluated in terms of percent error of the pressure differential being measured.

A VERTICAL water manometer must sometimes be used to check or calibrate other manometers used in ventilating and air-conditioning work. These latter manometers, because of one or more modifications to magnify liquid movement per unit of imposed pressure differential, cannot be considered to be standards. Their scales are often designed to indicate directly in inches of water, but they require calibration either by manufacturer or user. An account of a recent series of such tests should serve to illustrate one type of error that may occur, and point out the importance of preventing it.

A newly marketed commercial manometer, part of a Pitot-tube apparatus, was to be checked for accuracy against a vertical water manometer as a standard. The former is a combination of an inclined manometer and a vertical manometer in series, which utilizes special oil of specific gravity less than one, and requires that liquid movement in only one leg be noted. Because the scale of this instrument is compensated for these several factors to read directly in inches of water, it was thought desirable to make calibrating tests.

One leg of each of the two manometers was connected to a single air reservoir in which the pressure could be varied at will above and below atmospheric, while the other leg was left open. Great care was taken in properly setting up the manometers, and since the water manometer was being used as a standard, an accurate scale finely divided to fractions of an inch was installed between its legs and exactingly set to vertical with a plumb line. Also, it was seen that the water level in both legs was exactly at zero before proceeding with the tests.

Surprisingly, many tests in which various like pressures were imposed on the two manometers indicated that they did not agree exactly. In fact, the difference appeared continually to be about 4% of the pressure differential, and at first it was thought that readings of the commercial manometer must have been in error. However, investigation showed that the difference was due to the fact that only one leg of the water manometer had been regularly read, and this reading doubled to get values of total pressure differential. When readings of both legs of the water manometer were made, and the rise in one leg added to the fall in the other to get the value of the imposed pressure differential, both manometers agreed well. The rise in one leg of the water manometer always varied with the fall in the other.

The difference between the rise and fall in the two legs of the water manometer clearly must have been due to a difference in the average cross-sectional areas of the bores of the two legs. (Slight declination of the manometer legs from vertical, to the extent of as much as five degrees, is not sufficient to cause an error even approaching 4%.) If h is the total pressure differential imposed on a vertical manometer, and h_1 is the rise (or fall) of liquid in one leg having an average bore cross-sectional area A_1 and an average bore diameter D_1, and h_2 is the fall (or rise) of liquid in the other leg having bore area A_2 and bore diameter D_2, where h, h_1, and h_2 are all expressed in terms of height of the column of contained liquid, then:

$$h_1 = \frac{h}{1 + (A_1 \div A_2)} = \frac{h}{1 + (D_1^2 \div D_2^2)}$$

$$h_2 = \frac{h}{1 + (A_2 \div A_1)} = \frac{h}{1 + (D_2^2 \div D_1^2)}$$

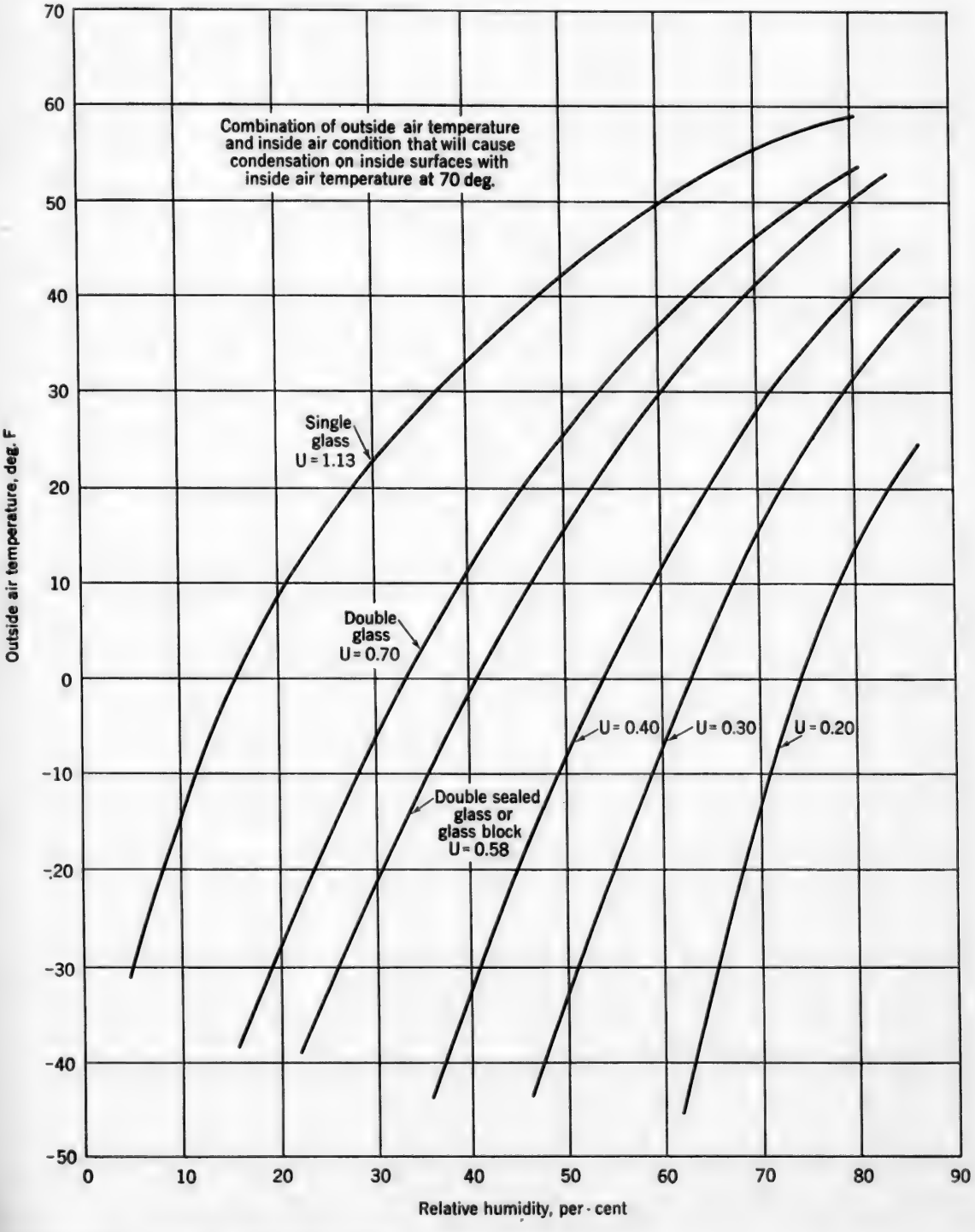
These equations are derived from considerations (1) that the total pressure differential is equal to the sum of the rise and fall in the two legs, and (2) that the volume of liquid in the manometer is constant. They indicate that only for equal bore cross-sectional areas ($A_1 = A_2$) does the rise in one leg equal the fall in the other and also equal one-half the total pressure differential ($h_1 = h_2 = \frac{1}{2}h$). If the bore areas are unequal, reading only one leg of the manometer and doubling the result will cause an error, expressed as a fraction of the true pressure differential, h, of:

$$1 - (A_{min.} \div A_{max.}) = 1 - (D_{min.}^2 \div D_{max.}^2)$$

where $A_{max.}$ and $D_{max.}$ are the larger bore area and diameter, respectively, and $A_{min.}$ and $D_{min.}$ are the smaller area and diameter. Examination of this error expression shows that, if the smaller bore diameter differs from the larger by only 2%, this is enough to cause an error in values of pressure differential, when only one leg of the manometer is read, of 4%. A difference in bore diameters of only 5% can cause an error of approximately 10%. Because of the allowable tolerances in outside diameter and wall thickness of common laboratory glass tubing, from which many manometers are made, large variation in bore diameter is possible. In the common tubing sizes of 7, 8, and 9 mm (outside diameter), variation in bore diameter of as much as 10 to 20% from the design bore size is possible, and in smaller tubing sizes even greater variation is in accordance with accepted manufacturing standards. Thus it is essential that both legs of a vertical manometer be read when true and precise values of pressure differential are required. In addition to compensating for varying bore diameter, the practice also nullifies the effect of slight declination of one or both legs from vertical (if the scale is exactly vertical), and the effect of the liquid level not being exactly at zero in both legs before test.

CONDENSATION ON GLASS SURFACES

Chart designed by E. W. Jerger, Associate Professor,
Department of Mechanical Engineering,
University of Notre Dame



PLUMBING SURVEY FORM FOR ADDITIONS AND ALTERATIONS

Included in the scope of design work for the engineer, are the alterations or additions to existing buildings. This type of work has its particular difficulties since it requires that a visit be made to the site and a thorough examination completed of the existing facilities in the building. This provides information regarding the location, condition and capacity of these building facilities. The field survey is made somewhat easier if record plans of the original design are available, but frequently they are not, and more often the facilities have been altered considerably since the initial installation.

If the project is located nearby, then frequent visits can be made although they are time-consuming. However, when the work is a good distance away, as much information as possible about the existing conditions must be obtained during one visit. It is neither practical nor economical to make extra visits to obtain data overlooked on a previous call.

There are numerous methods that may be used in making a field survey. Each engineer has a particular method that he follows to obtain and record the needed information. For those, however, who have not made a survey and who may wish to adopt a practical method for recording the findings on such a survey, the accompanying suggested record form designed by Louis Blendermann, is presented.

Project

Name .....No. .....
Address .....
Telephone No. .....
Custodian's name .....

Cold Water Service

Size .....Street Pressure .....
Location .....
Material.
(a) Copper .....
(b) Lead .....
(c) Corporation pipe .....
(d) Other material .....
Condition of service .....
Roof tank .....Size .....
Pumps .....
Water company.
(a) Name .....
(b) Telephone No. .....

Water Meter

Make .....Size .....
Location .....
Sketch of hook-up .....

Cold Water Lines

Material.
(a) Copper .....
(b) Brass .....
(c) Galvanized .....
(d) Other material .....
Condition of piping .....
Are present mains and risers of sufficient size for new work? .....

Hot Water System

Hot water storage tank.
(a) Size .....
(b) Location .....
(c) Manufacturer .....
(d) Material .....
Other method of heating water .....
(Draw a sketch if necessary)
Temperature of hot water .....
Piping material.
(a) Copper .....
(b) Brass .....
(c) Galvanized .....
(d) Other material .....
Condition of piping .....
Are present mains and risers of sufficient size for new work? .....

Sanitary System

Size of house drain .....
House sewer .....
Where do present lines discharge? ..
(a) Sanitary sewer.
(1) Size .....
(2) Location .....
(b) Septic tank system.
(1) Size of septic tank .....
(2) Size of tile field .....
(3) Location of both .....
(c) Elsewhere .....
If a sewage ejector exists—
(a) Manufacturer .....
(b) Size .....
(c) See nameplate for characteristics .....
(d) Location and piping hook-up ....
Are present soil and waste lines of sufficient size for new work? .....
Type of piping used .....
Sewer Department.
(a) Name .....
(b) Telephone No. .....
(c) Obtain plumbing code .....

Storm Water System

Where do present lines discharge?
(a) Storm sewer .....
(b) Combined sewer .....
(c) Curb .....
(d) Dry wells .....
(e) Elsewhere .....
Type of roof drains used .....
If a sump pump exists.
(a) Manufacturer .....
(b) Size .....
(c) See nameplate for characteristics .....
(d) Location and piping hook-up ....
Are present lines of sufficient size for the new work? .....
Type of piping used .....

Fire Standpipe System

Size of water service .....
Size of standpipe risers .....
Sketch of meter hook-up if any .....
Hose racks.
(a) Type .....Manufacturer .....
(b) Diameter of hose ....Length ....
(c) Hose thread requirements .....
(d) If adapters, type .....
Fire pump .....Booster pump .....
(a) Manufacturer .....
(b) Size .....Condition ....
(c) See nameplate for characterstics .....
(d) Sketch of hook-up ....Location ..
Fire Department or other authority.
(a) Name .....
(b) Telephone No. .....
(c) Obtain requirements .....
Are present mains and risers of sufficient size for new work? .....

Sprinkler System

Classification of present system .....
Size of water service .....
Type of present sprinkler heads .....
Spacing of heads .....
Fire pump.
(a) Manufacturer .....
(b) Size .....
(c) See nameplate for characteristics .....
(d) Sketch of hook-up ...Location ..
Roof tank.
(a) Size .....
(b) Location .....
(c) Condition .....
Fire Department or other authority.
(a) Name .....
(b) Telephone No. .....
(c) Obtain requirements .....
Are present mains and branches of sufficient size for new work? .....

Gas System

Size of gas service .....
Pressure .....
Size of gas meter .....Location .....
Condition of piping .....
Local gas company.
(a) Name .....
(b) Telephone No. .....
(c) Obtain their requirements .....
Are present mains and risers of sufficient size for new work? .....

Plumbing Fixtures

If plumbing fixtures are to be relocated and reused, or if the new fixtures must match existing one, obtain the following:
(a) Water closets ....type...trim...
(b) Urinals .....type...trim...
(c) Lavatories .....type...trim...
(d) Drinking fountains ..... type...trim...
(e) Other fixtures .....

Cafeteria Equipment

If new work is required—
(a) Condition of present equipment .....
(b) Which fixtures have 180F hot water .....
(1) How is it furnished .....
(2) Location of heater ...size ...
(c) Present grease interceptors—
(1) Manufacturer .....
(2) Size .....
(3) Location .....
Is present piping of sufficient size for new work? .....

Miscellaneous Piping and Equipment

Use this space for any piping, equipment or special conditions not covered .. ..

Date .....
Survey made by .....

Photo, Owens-Corning Fiberglas Co.

Overhanging Roofs Cut Summer Cooling Loads

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Overhanging roofs on residences can substantially reduce summer cooling load. Article outlines a method of estimating the reduction by calculation of the shadows cast. Illustrative examples are given.

DETERMINATION of the *absolute* quantity of the cooling load reduction due to overhanging roofs at a particular time would be very difficult because of complex variation of shaded areas with time, time lag of walls, and possible variation of the wall structure (i.e., glass windows or half brick and stucco wall).

Maximum cooling loads for average residences occur in the afternoon of the hottest day of the year, providing the previous days were also hot. From historical data the maximum cooling load and the time at which it occurs can be determined. However, the greatest reduction due to an overhanging roof of the maximum cooling load will be due to shading of the windows. The saving of instantaneous heat gain through windows is more significant if the exterior walls contain a large portion of glass, and therefore overhanging roofs become of greater value as the glass area increases.

Knowing the area of window shading produced by the overhanging roof, the intensity of the sun, the cosine of the angle of incidence, and transmissivity of the glass, the reduction of the solar radiation entering the house can be determined. If this heat were to enter the house, not all of it would influence the cooling load. Much of the heat would be absorbed by the floors. This absorption by the floors and other thermal capacities would depend on the particular situation. Correction factors for different cases would have to be found in order to obtain the *exact* reduction in cooling load. Though this method neglects the cooling load reduction due to the shading of the *walls* by the overhanging roof, it is believed that it will yield a quantity which will be the larger part of the instantaneous heat gain reduction.

Method Outlined

From the historical records, the hottest day of the summer in the locale of interest is found. For the conditions of this day, the maximum cooling load and the time of the day it occurs is determined, considering the house to have no overhanging roof. Then, by use of the method described below, the shaded areas of the windows produced by the overhanging roof are found. Some windows, due to the position of the sun, would be shaded in spite of the overhanging roof and therefore should not be included in the calculations. For each window shaded by the overhanging roof the angle of incidence and the transmissivity, which is a function of the angle of incidence, is obtained. Each shaded window area is multiplied by the cosine of its angle of incidence and its transmissivity. The sum of all these products for the shaded windows are multiplied by the solar intensity. This quantity will be the amount of reduction in heat entering a house through the windows at the time of maximum cooling load due to its overhanging roof. The

percentage of the reduction that would affect the cooling load multiplied by the quantity of heat reduction and subtracted from the previously obtained maximum cooling load results in the estimated actual maximum cooling load.

Derivation of the Formulas

Derivation of the formula for shadow area for only the most general case, that of the all glass straight wall, is shown in order to illustrate the method. Formulas covering many cases as well as the all glass straight wall are summarized in the table.

Shadow Area Determined

Fig. 1 shows plan, front elevation, and side elevation of an all glass wall of height (h) and width (B), on which is cast a shadow of depth (x) from roof with overhang (b). Letters (p) and (q) help define the shape of the shadow. Further, γ = wall solar azimuth, β = solar altitude, and α is an angle in the plane of the wall.

From the plan view, $\cos\gamma = \frac{b}{y}$, $\therefore y = \frac{b}{\cos\gamma}$; and

from side elevation, $\tan\beta = \frac{x}{y} = \frac{x\cos\gamma}{b}$; and

$$x = b\frac{\tan\beta}{\cos\gamma}; \text{ also} \qquad (1)$$

$$\tan\gamma = \frac{z}{b}; \therefore z = b\tan\gamma \qquad (2)$$

From the front elevation, $\tan\alpha = \frac{z}{x}$. Substituting (1) and (2), $\tan\alpha = \frac{\cos\gamma}{b\tan\beta} \cdot b\tan\gamma = \frac{\cos\gamma\tan\gamma}{\tan\beta}$.

Since $\tan\gamma = \frac{\sin\gamma}{\cos\gamma}$, $\tan\alpha = \frac{\sin\gamma}{\tan\beta}$. (3)

Basic shaded area (A_b), neglecting end effect = Bx, and from (1),

$$A_b = Bx = Bb\frac{\tan\beta}{\cos\gamma} \qquad (4)$$

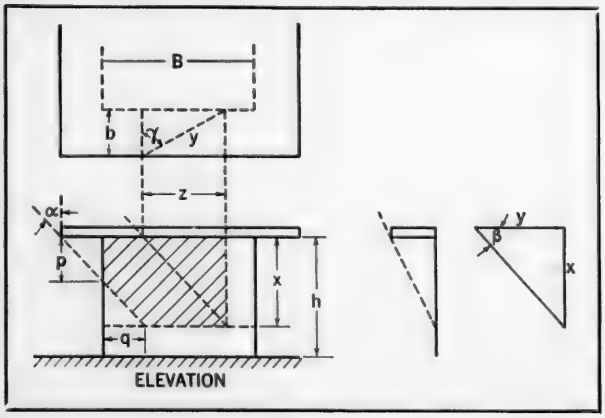


Fig. 1

From the front elevation, $\tan\alpha = \frac{b}{p}$; $\therefore p = \frac{b}{\tan\alpha}$.

Substituting the foregoing and (1), $x - p = b\frac{\tan\beta}{\cos\gamma} - \frac{b}{\tan\alpha}$. Since, from the elevation, $\tan\alpha = \frac{q}{x-p} = \frac{b}{p}$,

$$q = \frac{b(x-p)}{p} \qquad (5)$$

The unshaded triangular area bound by $x - p$ and q is $A_u = q\frac{(x-p)}{2}$. Substituting (5), then (1),

$$A_u = \frac{b(x-p)}{p} \cdot \frac{(x-p)}{2} = \left(\frac{\tan\beta}{\cos\gamma} - \frac{1}{\tan\alpha}\right)^2 \frac{b^2\tan\alpha}{2} \qquad (6)$$

Net shaded area (A) = $A_b - A_u$. From (4) and (6), $A_b - A_u = Bb\frac{\tan\beta}{\cos\gamma} - \frac{b^2\tan\alpha}{2}\left(\frac{\tan\beta}{\cos\gamma} - \frac{1}{\tan\alpha}\right)^2$. Substituting (3), we have

$$A = Bp\frac{\tan\beta}{\cos\gamma} - \frac{b^2\sin\gamma}{2\tan\beta}\left(\frac{\tan\beta}{\cos\gamma} - \frac{\tan\beta}{\sin\gamma}\right)^2 \qquad (7)$$

Letting $D = \frac{\tan\beta}{\cos\gamma}$, and $E = \tan\alpha = \frac{\sin\gamma}{\tan\beta}$, then A $= BbD - \frac{b^2}{2}E\left(D - \frac{1}{E}\right)^2$. Letting $F = \frac{E}{2}\left(D - \frac{1}{E}\right)^2$, then

$$A = BbD - b^2F \qquad (8)$$

for the case where $q < B$ and $x < h$.

By similar reasoning, where $x > h$ and $q < B$, and where $q > B$ and $x > h$, the remainder of the formulas in the table under the heading of all glass walls were derived.

Note also, that from (1)

$$x = b\frac{\tan\beta}{\cos\gamma} = bD$$

and from (5) and (6)

$$q = \frac{b(x-p)}{p} = b(ED - 1)$$

Example 1, All Glass Straight Wall

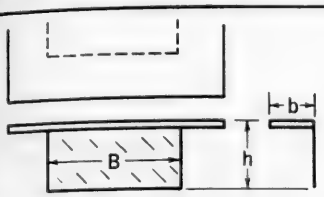
Dimensions and Conditions (See Fig. 2).

B = 30 ft	South Wall
h = 10 ft	Latitude, 40 deg north
b = 3 ft	Date, August 1st
	Time, 3:00 pm

Shadow Areas Cast by Overhanging Roofs

γ = wall solar azimuth (if greater than 90°, wall is shaded) — β = solar altitude

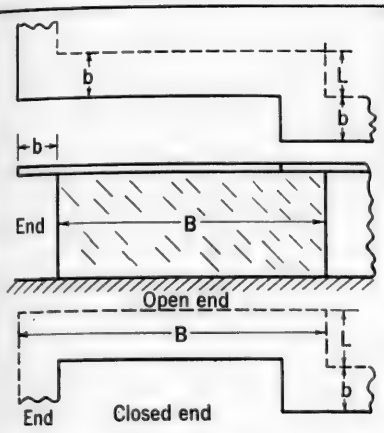
STRAIGHT ALL GLASS WALLS



$D=\frac{\tan\beta}{\cos\gamma}$ $\quad E=\frac{\sin\gamma}{\tan\beta}$ $\quad F=\frac{E}{2}\left(D-\frac{1}{E}\right)^2$ $\quad x=bD$ $\quad q=b(ED-1)$

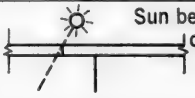
Shaded area	
$A=BbD-b^2F$	$q>B$, $x<h$
$A=Bh-\frac{E}{2}\left(h-\frac{b}{E}\right)^2$	$q<B$, $x>h$
$A=\frac{B^2+2Bb}{2E}$	$q>B$, $x>h$

OFFSET ALL GLASS WALLS



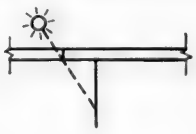
$w=(L+b)D$ $\quad v=\frac{b}{E}$ $\quad$ D,E,F as for straight walls $\quad A=BbD+Aa$

Sun behind adjacent overhang



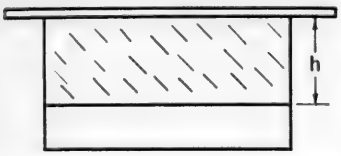
$w<h$	$Aa=(hE+bDE+2b)(h-bD)-\frac{E}{2}[h^2-(L+b)^2D^2]$	
$w>h$	$Aa=(hE+bDE+2b)\frac{(h-bD)}{2}$	

Sun ahead adjacent overhang



$w>h$	$v<h$	$Aa=\left(\frac{b}{E}-bd\right)^2\frac{E}{2}$	If end is open, subtract b^2F
	$v=h$	$Aa=(h-bD)^2\frac{E}{2}$	If end is open, subtract b^2F
	$v>h$	$Aa=[2b-E(h+bD)](h-bD)$	If end is open, subtract b^2F
$w<h$	$v<h$, $w<v$	$Aa=\left(\frac{b}{E}-bd\right)^2\frac{E}{2}-\left[\frac{b}{E}-(L+b)D\right]^2\frac{E}{2}$	If end is open, subtract b^2F
	$v=h$	$Aa=(h-bD)^2\frac{E}{2}-[h-(L+b)D]^2\frac{E}{2}$	
	$v>h$	$Aa=[2b-E(h+bD)](h-bd)\frac{1}{2}+(b-hE)+[b+(h-D[L+b])E][h-D(L+b)]$	If end is open, subtract b^2F

WINDOWS EXTENDING LENGTH OF THE WALL

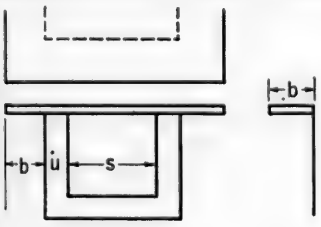


Redefine "h" and use equations for all glass walls.

If there is a beam across the top of the window,

subtract its area from the total shaded area.

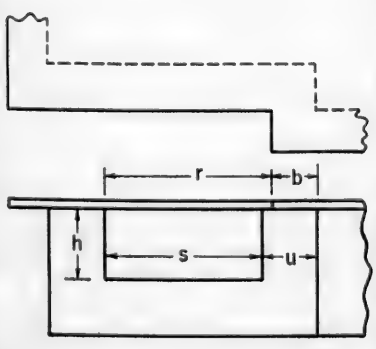
ORDINARY WINDOWS - STRAIGHT WALLS



$x=bD$	$\theta=bDE$	E as defined for straight walls
$b+u+s>\theta>b+u$, $x<h$		$A=x(b+u+s-\theta)+(\theta-b-u)\left[\frac{x}{2}+\frac{b+u}{2E}\right]$
$b+u+s>\theta>b+u$, $x>h$		$A=(b+u+s)h-h^2E+\left[\frac{h}{2}+\frac{b+u}{2E}\right](hE-b-u)$
$hE>b+u+s$		$A=\left[\frac{b+u}{2E}+\frac{b+u+s}{2E}\right]s$
$hE<b+u$		$A=sh$
$x<h$, $xE<b+u$		$A=bDs$

If there is a beam across top of window, subtract its area from the total shaded area

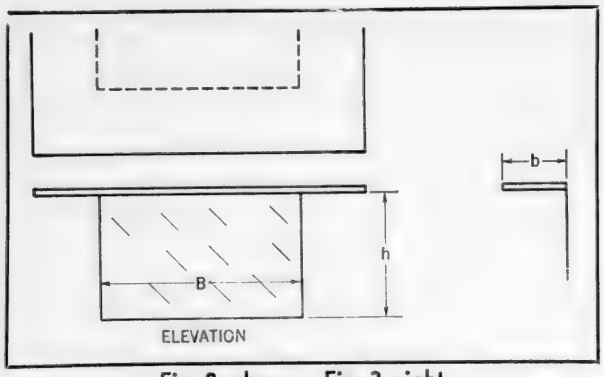
ORDINARY WINDOWS - OFFSET WALLS



D,E as defined for straight walls

Sun behind adjacent overhang (see offset walls) $L=bDE$ $q=\frac{r-L}{E}$ if $L>r$, or $q<o$, window is completely shaded	$hE+b>s+u$, $q>o$, $u<b+L$	$A=sh-\frac{(r-L)^2}{E}$
	$hE+b<s+u$, $q>o$, $u<b+L$	$A=bDs+(h-bD)[Eh+L+2(s-r)]$
	$hE+b>s+u$, $q>o$, $u>b+L$	$A=bDs+s\left(h-\frac{r}{E}-\frac{s}{2E}\right)$
	$hE+b<s+u$, $q>o$, $u>b+L$	$A=bDs+\left[h-\frac{r-s}{E}\right]\frac{h}{E}\frac{r+s}{2}$
	$hE+b<u$	$A=bDs$
Sun ahead of adjacent overhang (see offset walls) $v=\frac{b-u}{E}$ if $x>h$, window is completely shaded $w=(L+b)D$ $x=bD$	$v<h$, $w>h$, $b>u$	$A=bDs+(b-u-bD)\frac{b-u-bDE}{2E}$
	$v>h$, $w>h$, $b>u$	$A=bDs+(h-bD)\frac{2b-2u-bDE-hE}{2}$
	$v>h$, $w<h$, $b>u$	$A=bDs+LD\left[b-u-DE\left(b-\frac{L}{2}\right)\right]$

If there is a beam across top of window, subtract its area



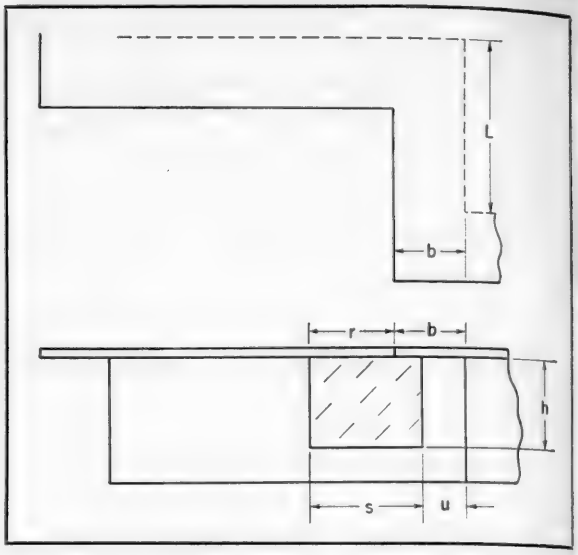


Fig. 2, above. Fig. 3, right

Determination of shaded window area follows:

From "1956 Heating Ventilating Air Conditioning Guide," table 13–6

$\beta = 45.5$ deg

$\gamma = 74$ deg

Determine D and E.

$$D = \frac{\tan\beta}{\cos\gamma} = \frac{1.018}{0.276} = 3.68$$

$$E = \frac{\sin\gamma}{\tan\beta} = \frac{0.961}{1.018} = 0.944$$

Find x and q.

$x = bD = (3)\ (3.68) = 11.05$ ft.

$q = b\ (ED - 1) = 3[(.944)\ (3.68) - 1]$

$= 7.41$ ft.

$q < B$ and $x > h$

Equation 2 of table, under heading "Straight All Glass Walls" is seen to apply

$$A = Bh - \frac{E}{2}\left(h - \frac{b}{E}\right)^2$$

$$A = (30)\,(10) - \left(\frac{.944}{2}\right)\left(10 - \frac{3}{0.944}\right)^2$$

$$= 300 - 22 = 278 \text{ ft}^2$$

Determination of cooling load reduction.

From the *Guide:*

K = cosine of the incident angle = 0.196 (table 13–5)

incident angle $\theta = 79$ deg (math tables)

transmissivity $\tau_D = 0.45$ (table 13–12)

direct solar radiation $I_{Dn} = 266$ Btu per hr per sq ft (table 13-4)

Cooling Load Reduction $= AK\tau_D I_{Dn}$

$= (278)\ (0.196)\ (0.45)\ (266)$

$= 6{,}540$ Btu per hr

Example 2, Ordinary Window on Offset Wall

Dimensions and Conditions (See Fig. 3).

b = 3 ft	Southwest Wall
L = 8 ft	Latitude, 40 deg north
h = 7 ft	Date, August 1st
u = 2 ft	Time, 4:00 pm
s = 10 ft	
r = 6 ft	

From the *Guide,* Table 13–6

$\beta = 34.5$ deg

$\gamma = 40.0$ deg

Determine D and E.

$$D = \frac{\tan\beta}{\cos\gamma} = \frac{0.687}{0.766} = 0.897$$

$$E = \frac{\sin\gamma}{\tan\beta} = \frac{0.643}{0.687} = 0.936$$

Since it is 4:00 pm the sun is ahead of the adjacent overhang.

Determine v and w.

$$v = \frac{b - u}{E} = \frac{3 - 2}{0.936} = 1.07$$

$w = (L + b)D = (8 + 3)\ 0.897 = 9.87$

$v < h$, $w > h$, $b > u$

The Equation below is seen to apply:

$$A = bDs + (b - u - bD\left[\frac{b - u - bDE}{2E}\right]$$

$$= (3)\ (0.897)\ (10) + [3 - 2 - (3)\ (0.897)]\left[\frac{3 - 2 - (3)\ (0.897)\ (0.936)}{(2)\ (0.936)}\right]$$

$= (26.91) + (-1.691)\ (-1.520)\ /\ (1.872)$

$= 28.28$ sq ft.

Determination of cooling load reduction.

From the *Guide:*

K = cosine of the incident angle = 0.631 (table 13–5)

incident angle $\theta = 51$ deg (math tables)

transmissivity $\tau_D = 0.84$ (table 13-12)

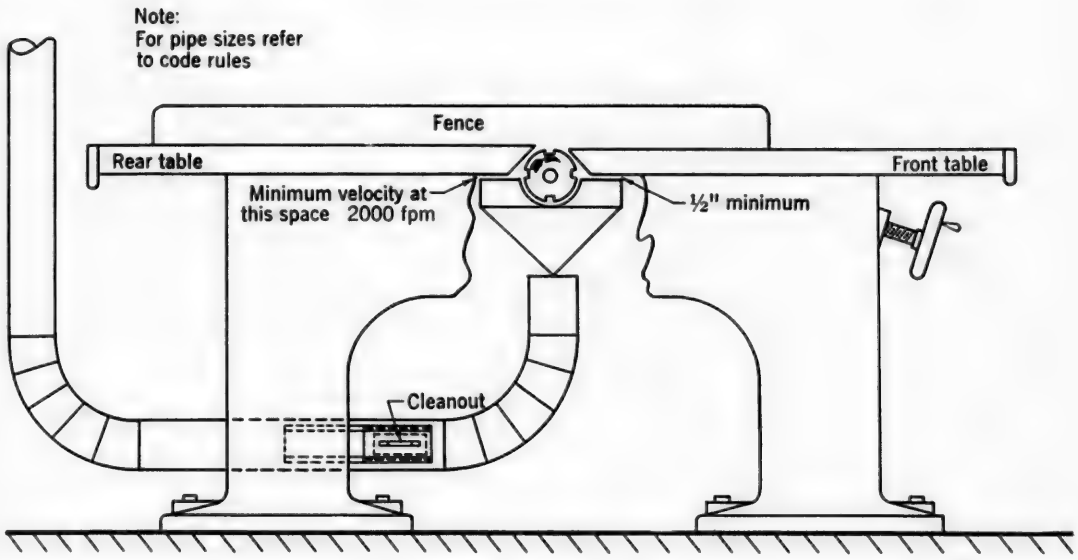
direct solar radiation $I_{Dn} = 248$ Btu per hr per sq ft (table 13-4)

Cooling Load Reduction $= AK\tau_D I_{Dn}$

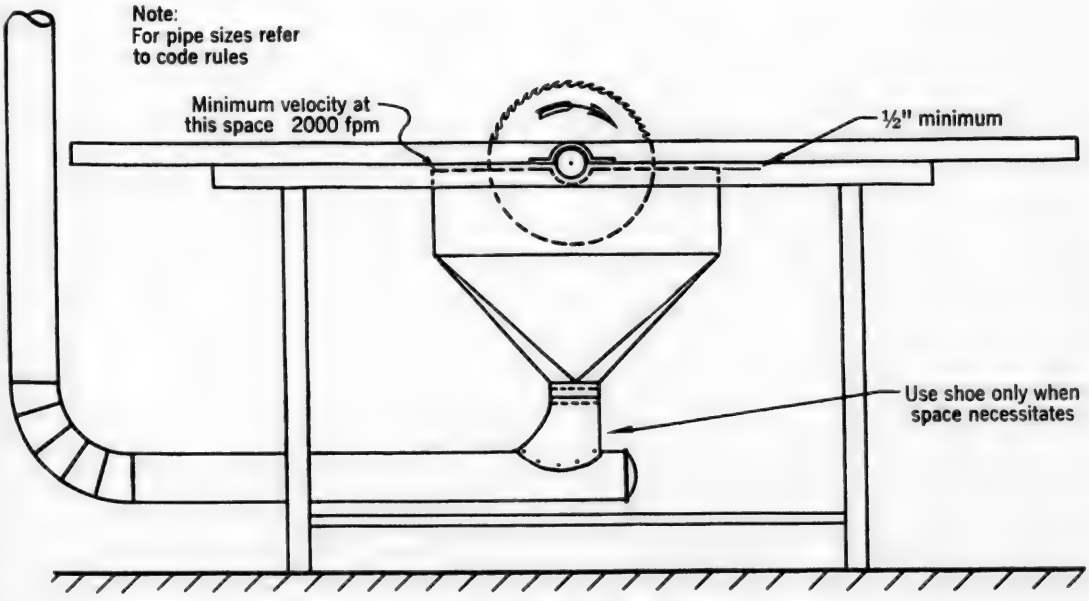
$= 28.28\ (0.631)\ (0.86)\ (248)$

$= 3800$ Btu per hr.

EXHAUST SYSTEMS FOR POWER TOOLS



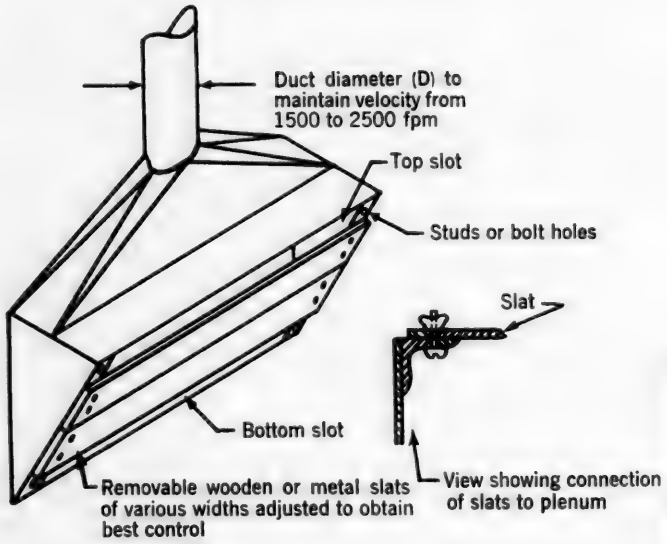
EXHAUST FOR JOINTER



EXHAUST FOR TABLE SAW

Drawings Through Cooperation of New York State Department of Labor,
Division of Industrial Hygiene—Engineering Unit

SLANT HOOD FOR TANK EXHAUST

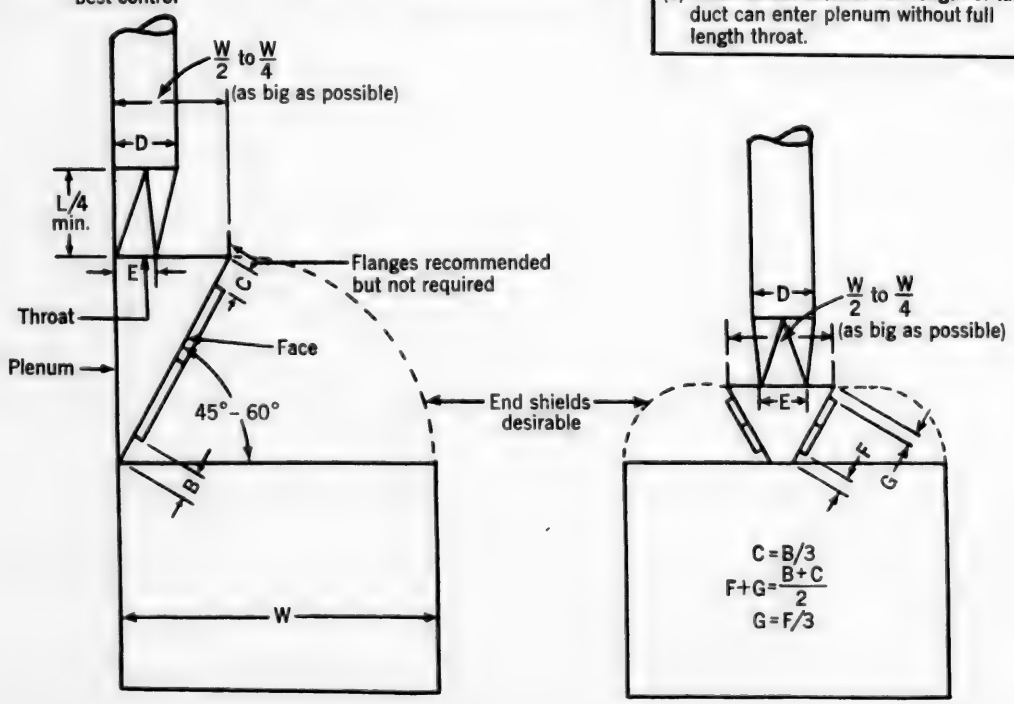

Duct diameter (D) to maintain velocity from 1500 to 2500 fpm
Top slot
Studs or bolt holes
Slat
Bottom slot
Removable wooden or metal slats of various widths adjusted to obtain best control
View showing connection of slats to plenum

Air quantity required (cfm per min.) = tank area (L x W) x ventilation rate (cfm per sq ft)

MINIMUM VENTILATION RATES	
Cold Process	75 to 100
Mist Producing Process	100 to 150
Hot Tanks (over 190 deg F)	150 to 200

Design Proportions	Means of Air Distribution	
	Plenum Throat	Plenum Face
E	0.05W - 0.1W(a)	0.1W - 0.2W(b)
B+C	0.1W - 0.2W	0.05W - 0.1W

(a) Throat must extend full length of tank.
(b) When throat extends full length of tank, duct can enter plenum without full length throat.



Drawing Through Cooperation of New York State Department of Labor, Division of Industrial Hygiene—Engineering Unit

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Expansion in Hot Water Piping Systems

AN IMPORTANT consideration in the design of piping distribution systems, especially hot water, is that of expansion. Unless this factor is given adequate attention, the flexibility needed to compensate for the linear movement in the piping will not be available. Since piping material will expand to some degree when heated, serious water leaks can result from cracked fittings or piping connections.

Fortunately, in most installations there is a certain amount of give to the piping systems which offsets the effects of linear expansion. For example, when expansion takes place, the piping may sag or arch to compensate for the linear movement. Many times, because of the short runs of piping and the number of offsets in the piping, the linear expansion will have no serious effect. However, in long piping runs, although no serious leaks develop initially, a tremendous strain is imposed upon certain fittings and pipe connections. When this condition is prevalent, it is merely a matter of time before leaks or cracked fittings will result from the strain. One way in which expansion can impose such strain on fittings and connections is shown in Fig. 1.

This figure shows a length of horizontal piping with vertical branches, and what takes place when pipe, for example, is installed in an ambient temperature of 70 deg, and then conveys water at 140 deg.

The total linear expansion of this line has placed a tremendous strain at the elbow on the end of the run. Moreover, the branch lines are no longer perpendicular to the main but are now at an angle to the main in proportion to the length of piping run. Swing connections to the top of the main have been shown to portray the amount of movement. If fittings such as these are used, the swinging of the fittings could easily cause leaks. If the branches are connected to the main in a rigid manner, severe strain will result at the connections. Cracked fittings can result.

The more extensive the piping distribution system, the greater the danger from the effects of expansion. Rather than leave the matter of expansion to chance, it is much safer to include devices that will compensate for this natural function in heated pipe.

Expansion in Different Piping Materials

Galvanized steel, galvanized wrought iron, brass and copper are materials most generally employed for interior water piping systems. Each of these materials has a different linear expansion when heated to specific temperatures. Table I indicates the degree of expansion that

TABLE I—LINEAR EXPANSION FOR VARIOUS METALS

Temperature, Degrees, F	Inches per 100 Feet			
	Steel	Wrought Iron	Brass	Copper
0	0	0	0	0
20	0.15	0.155	0.25	0.26
40	0.30	0.31	0.45	0.45
60	0.455	0.475	0.67	0.65
80	0.61	0.63	0.92	0.87
100	0.77	0.80	1.17	1.10
120	0.915	0.96	1.41	1.35
140	1.075	1.13	1.69	1.57
160	1.235	1.29	1.91	1.77
180	1.40	1.46	2.15	2.00

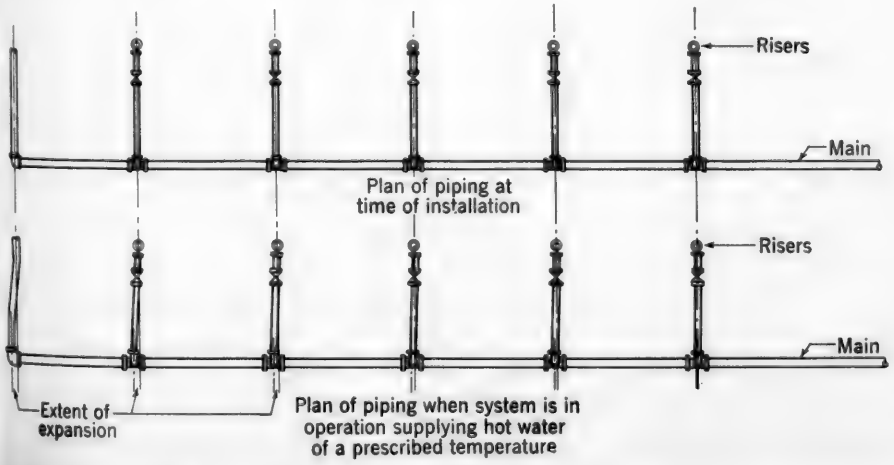

Risers
Main
Plan of piping at time of installation
Risers
Main
Extent of expansion
Plan of piping when system is in operation supplying hot water of a prescribed temperature

Fig. 1. Action of linear expansion in a hot water line and its effect on branch connections.

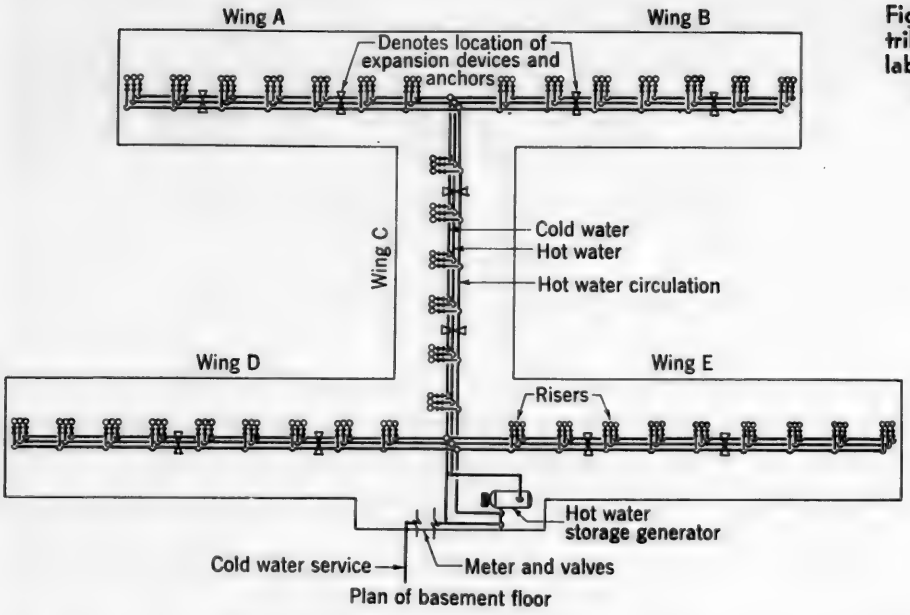


Fig. 2. Typical water piping distribution system in a research laboratory showing location of expansion devices and anchors.

will take place when each of the materials is heated to varying temperatures.

The table of linear expansion is only a partial one but shows the factor of expansion for the different piping materials listed. It shows that steel expands the least while brass expands the most. Knowing the range of minimum and maximum temperatures the line will be subjected to, it is easy to determine the limits of expansion that can be expected.

Expansion in Horizontal Piping Runs

The more extensive the piping distribution system becomes, the more important the need for proper expansion control. Figure 2 represents a horizontal piping distribution system as may be found in the basement or ground floor of a research laboratory building. This type building has been used for example because of its size and spread-out nature. Furthermore, because the piping runs are so long in this type of building, it offers a good example for the complicated problems created by expansion.

Referring to Fig. 2, you will note the specific locations where expansion devices have been placed. These devices will confine the linear expansion of the piping to the sections of pipe installed between the expansion devices. Since several hundred lineal feet of piping run is involved in Fig. 2, the total expansion, unless restricted, could be rather extensive, thereby imposing considerable strain on the piping connections.

Expansion Devices

There are a number of different devices that can be utilized to handle expansion in piping systems. Such devices may be classified as the pipe loop type, piston type or the bellows type. Figure 3 shows the first two.

Detail *A* of Fig. 3 illustrates a typical expansion loop which can be constructed in a number of different ways and shapes. The required dimensions of the loop for a given installation is easily calculated or can be found in the engineering data tables contained in piping handbooks. This type of device is very effective in solving expansion problems; its only disadvantage, in some instances, is the amount of space needed for the installation of this device.

The piston type expansion device shown in Detail *B* is a manufactured device available in a number of different types. When expansion takes place, one section of the unit telescopes into the other. The flanged unit serves to tighten the device and avoids leakage. This device is very practical but must be carefully installed to ensure that the device is perfectly aligned with respect to the piping.

The bellows type of device, not shown, is also available in a number of different types and shapes. This device consists of some form of bellows that will contract when expansion takes place.

Trapeze Hangers

The piping distribution system at the basement or ground floor must be supported in a substantial manner. Devices most frequently used for this purpose are called trapeze hangers, and one type unit is shown in Fig. 4.

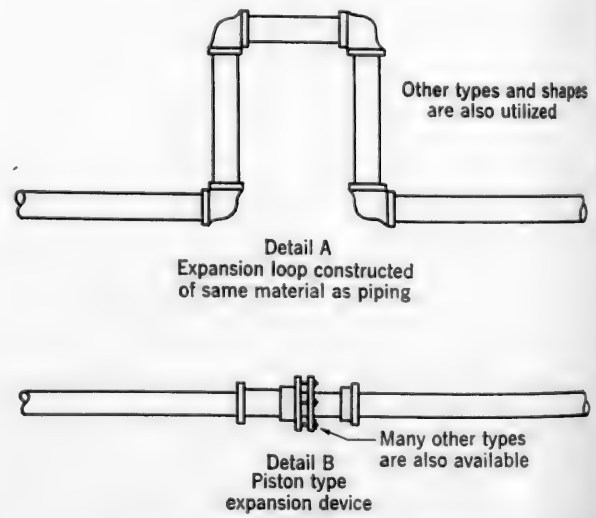

Other types and shapes are also utilized
Detail A
Expansion loop constructed of same material as piping
Many other types are also available
Detail B
Piston type expansion device

Fig. 3. Typical expansion devices.

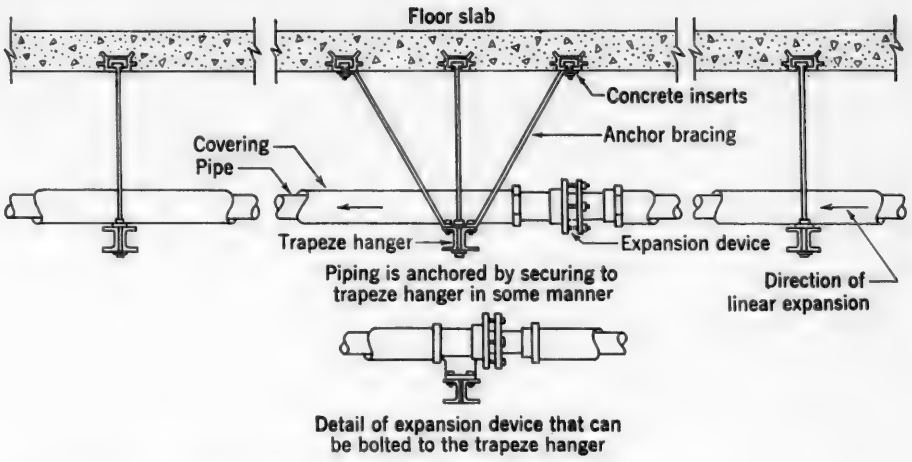


Fig. 5. Detail of expansion device and anchoring methods.

This unit may be constructed in a number of different ways. It consists of two steel channels mounted back to back and supported by steel rods anchored to the slab construction. The steel rods may be supported either by a concrete insert or a steel plate resting on the rough slab as shown. The steel rods pass between the channels and are rigidly secured in place. Manufactured roller supports on which the piping will rest are placed on the trapeze hanger. Since the water lines are generally insulated, covering protective devices are set into the underside of the covering where it comes in contact with the roller. These rollers provide adequate support but yet permit linear expansion of the lines. Very often, U-bolts are fitted around the piping to remove any danger of the pipe slipping off the rollers, in cases where severe expansion takes place.

The branch water lines are taken from their respective mains at a 45 deg angle. The cold and hot water branches are equipped with riser control valves while the hot water circulation line is equipped with a balancing valve. The balancing valves ensure an even distribution of hot water throughout the entire hot water piping system.

Anchoring

In order to limit the expansion of the hot water lines to certain confined areas, suitable expansion devices must be employed. To make certain that the expansion devices will function as they should, anchoring devices are utilized. Figure 5 suggests a method of anchoring that can be used with considerable success where anchoring is accomplished at the trapeze hanger following the expansion device. The piping is secured to this anchored trapeze in any of a number of different ways. In Fig. 5, although it is not shown, the piping is anchored to the trapeze by means of a U-bolt placed around the bare piping and secured to the trapeze. Some expansion devices, Fig. 5, are so made that they can be fastened directly to the trapeze.

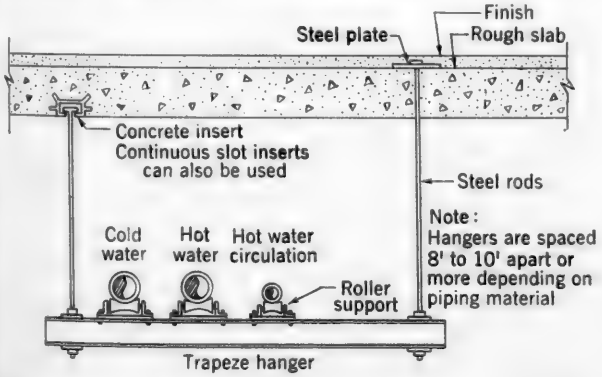


Fig. 4. Detail of a trapeze hanger for supporting water piping.

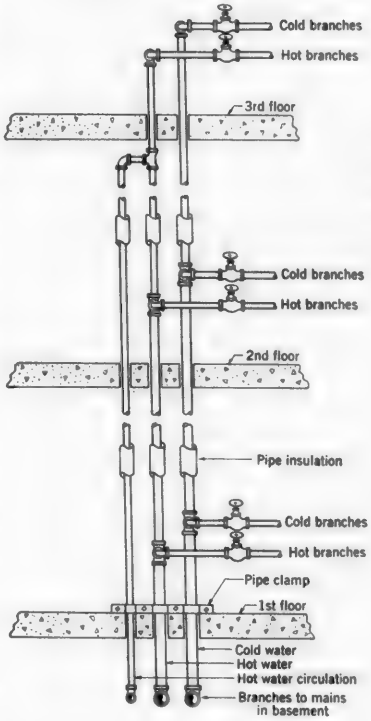


Fig. 6. Arrangement of risers for laboratory building that is shown in Fig. 2.

The function of the expansion device and anchored trapeze is to prevent the entire run of piping from expanding as a unit, but instead to confine it to prescribed sections of piping. For example, let us suppose that a hot water line of a given material is about 200 ft long, and when heated will expand approximately 2 in. This increase in length of piping can be sufficient to impose a strain on all the branches connected to the run. The branches near the end of the run must endure the greatest strain.

If one expansion device were placed at the center point

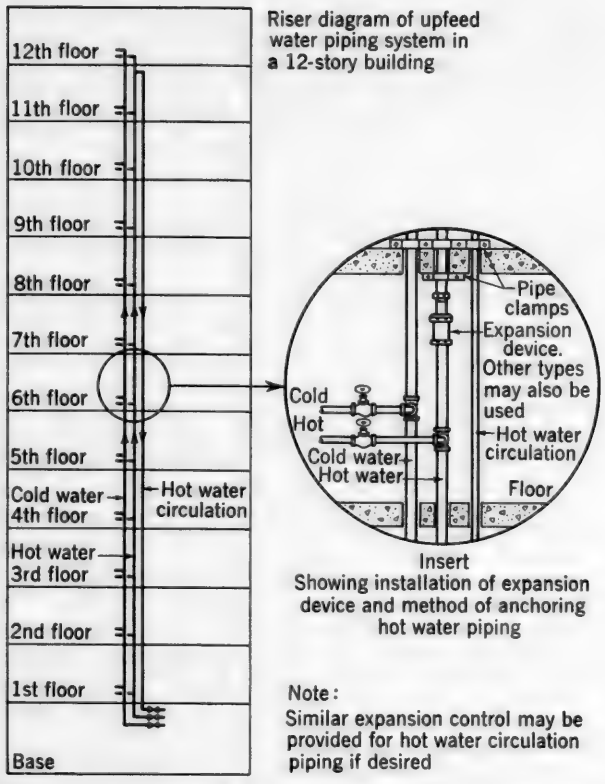


Fig. 7. Arrangement for expansion and anchoring devices on hot water piping in a 12-story building.

of the 200 ft run, the total expansion in each section of this run would only be 1 in. If expansion devices were placed every 50 ft, the total expansion in each section of pipe would be reduced to ½ in. Depending upon the specific requirements of a design, the amount of expansion can be kept within any desired limit.

Risers

Figure 6 illustrates typical water risers that might be used with the system of piping shown in Fig. 2. These risers would serve the upper floors in the research laboratory. Figure 6 shows the cold, hot and hot water circulation lines along with the branch takeoffs to the fixtures. Since the height of risers does not exceed 25 to 30 ft, there is no need for expansion devices, but it is necessary in this installation to avoid rigid branch connections. Branch piping should be installed with enough flexibility to allow for the slight movement in the vertical piping.

Tall Buildings

Now let us study the condition of expansion in a building, Fig. 7, that is 12 stories high. A typical set of water risers, as may be designed for this building, is illustrated. This type of supply is known as an upfeed water distribution system. Assume that the total height of the piping is 100 ft and it is desired to place an expansion device at the middle point of the hot water piping.

The insert shows the placement of the expansion device. The lower 50 ft of piping will expand and compress the device while the upper 50 ft of piping has freedom to expand in an upward direction. It is always advisable to provide an access door or other means for inspection and care of the expansion device.

Two sets of pipe clamps are included for the support of the piping at the expansion device. These combined pipe clamps are the anchor. The lower pipe clamp prevents the piping from expanding any further in an upward direction while the other pipe clamp supports the upper 50 ft of piping so that its weight will not be carried by the expansion device.

Expansion device protection is afforded the hot water circulation line in a similar manner.

Very Tall Buildings

Figure 8 shows typical water piping risers as they may be installed in a 20-story building. This piping system is the downfeed type, meaning that both cold and hot water are distributed at the highest floor in the building and extend downward to supply each floor of fixtures. The expansion device is installed in a like manner to that shown in Fig. 7. Because of the building height, two expansion devices are utilized with similar anchoring procedure.

Since pipe clamps are placed at every second or third floor to support the piping, the piping itself can only expand in an upward direction. Therefore, the piping above these two expansion devices has some freedom to move in an upward direction. Sections of piping below these devices will expand upward and compress the expansion device.

Although the pipe clamps at the various floors support the piping, the uppermost ones in each section of piping will be lifted clear of the floor with the expansion of the piping contained in that particular section. Similar consideration must be given to the installation of expansion loops or any other type of expansion devices that may be used.

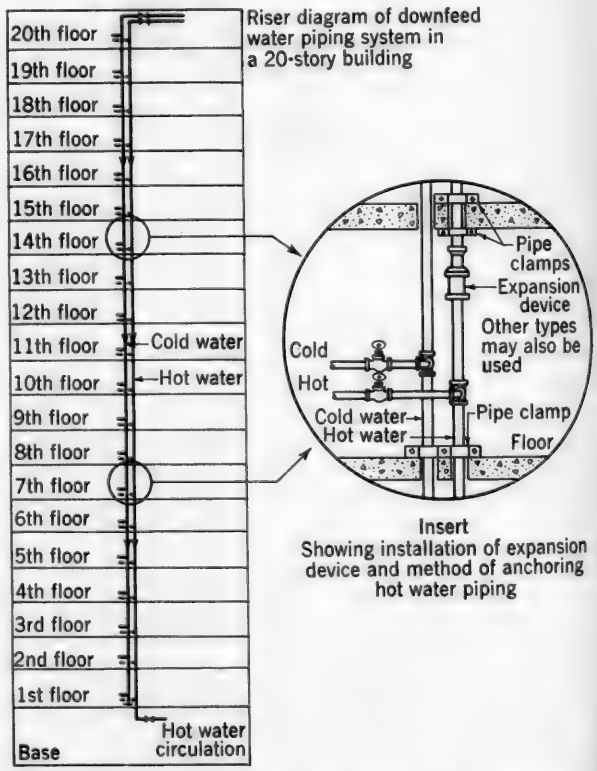


Fig. 8. Arrangement for expansion and anchoring devices on hot water piping in a 20-story building.

AIR CONDITIONING, HEATING AND VENTILATING'S

Reference Section

Design of Multiple Gas Vents

RICHARD L. STONE
Metalbestos Division, William Wallace Company, Belmont, Calif.

Tables and methods of procedure to follow in gas vent design; installation drawings are included

AIR CONDITIONING, HEATING AND VENTILATING — JULY, 1957

Design of Multiple Gas Vents

Using Insulated, Double-wall All-metal Type B Gas Vent Pipe

RICHARD L. STONE
Metalbestos Division, William Wallace Company, Belmont, Calif.

Gas vents can and should be installed to remove all products of combustion to the outdoors. To do this requires an integrated approach to vent system design, combining knowledge of vent material characteristics, with understanding of the governing physical principles of gas vent system operation. Using modern double-wall materials, gas vents can be built which function without hazard to the occupants from spillage-pollution, without damage to the vent material or building from condensation corrosion, or without hazard to combustible structure from excessive heat loss from outer vent surfaces.

PRINCIPLES of gas vent design and sizing have been evolved by application of the Kinkead equations to the point that any grouping of appliances, whether at the same or on multiple levels of a structure, can be successfully vented into a combined vent system. Furthermore, the application of these principles to installation of gas vents assures safe operation to comply with the intent of existing codes and test standards controlling both the selection of gas vent materials, and their use within buildings.

As a basis for future development of venting codes, the following four points are proposed, as unifying criteria of a proper gas vent design code:

1. Prevention of draft hood spillage to prevent indoor air pollution.
2. Prevention of hazard to structure from heat.
3. Prevention of damage to structure from condensation through selection of insulated, corrosion-resistant materials which prevent condensation by keeping heat in the vent gases where it belongs.
4. Designing for reasonable vent operation temperatures, within maximum and minimum limits, as a unifying principle.

An elementary combined vent for two appliances, called *A* and *B*, can be divided into three sections or branches. It has Connector *A*, Connector *B*, and the combined vertical section *C*. Such a system must be designed to prevent draft hood spillage when either or both appliances are on. The common vent—and the system—has three operating conditions.

These may be diagrammed as follows:

	Connectors		Common Vent Contains
1.	A On B Off		A gas + B dilution air
2.	A Off B On		B gas + A dilution air
3.	A On B On		A and B gas

Also each connector has three operating conditions; hot gas when its appliance is on, cold air when it is off, and a different temperature when both appliances are on together. To obtain complete positive venting in a combined vent, proper connector design for single appliance operation is the key factor. For each connector, the correct diameter and vertical rise must be found in relation to the appliance to which the connector is attached. The connector must produce its share of the total draft, and must also deliver enough heat to the common vent so that the common vent can contribute the balance of the needed draft. Of the two parts, the connector is the more important, although proper sizing and adequate height for the common vent are also essential.

Combined Vent Operation

The fundamental principle of combined vent operation is that the total of draft developed in the connector with only one appliance on, plus that in the common vent, must produce sufficient flow (in the in-use connector)

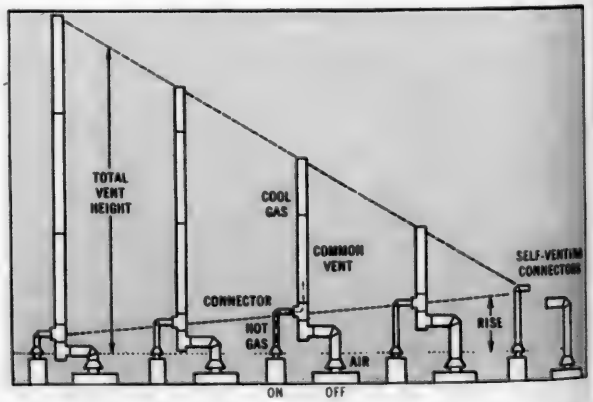


Fig. 1. Reduction in total vent height by increasing rise of connector.

to prevent any draft hood spillage at the operating appliance. The most critical operating condition—lowest flow or weakest draft—exists when the smaller appliance is on by itself. This results from the "open fireplace effect" of cold air dilution through the larger draft hood. This reduces both the vent gas temperature, and draft above the point of interconnection. Compensation for the effect of this expected reduction in temperature requires adequate vertical rise or elevation in each and every connector, or increased connector size, together with increased size or height of the common vent.

If a connector itself is high enough, it will be self-venting and the common vent to which it is attached will not have to produce any draft. For a self-venting connector, the "open-fireplace effect" of the other draft hood cannot cause draft hood spillage. But since it is seldom feasible to install self-venting connectors in ordinary residences or wherever headroom is 8 ft or less, most combined vents must operate with connectors that are too low, have too little vertical rise, or are too short to be self-venting. Thus the common vent, working at a much lower temperature, must make up enough draft difference to prevent draft hood spillage.

The limits of connector operation are explored in Fig. 1. At one extreme is a connector with so little vertical rise, that infinite common vent height will not prevent draft hood spillage. At the other extreme is the self-venting connector, which needs no common vent at all. Between them are those systems where each part of the combination is contributing its share to satisfactory vent operation.

In applying these principles to combined vent design, a complete mathematical analysis, or model was developed by Alan Kinkead. Carefully designed laboratory experiments, reported in "Let's Face Gas Venting,"* demonstrated the validity of the analysis.

Design Concepts

Gradually the concept of independent branch design was evolved, so that the dimensions of each portion of the system could be found without concern for the subsequent sizing of the remainder. To do this, it was necessary to study what constituted the most critical operating condition of connector *A*, connector *B*, and the combined, or common section *C* for all combinations of sizes. This most critical condition would then determine limits of the tabulated design factors.

It turned out that the most critical operating condition of any small size connector resulted when interconnected with the largest size connector within the scope of the tables. Thus where the tables cover 3 to 8 in. diameter connectors, the most difficult operating condition for the 3 in. connector exists when it is interconnected with an 8 in. connector. In the tables, the limits of operation, or design requirements for the 3 in. or any other size connector are based on the assumption of interconnection with the 8 in. connector. Interconnection with any size less than 8 in. will result in a margin for safer operation, because of lowered cold air dilution in the common vent as the size of the larger connector is reduced.

For connectors, these design methods introduce a new dimension which compensates for common installation difficulties. This dimension is connector size. It was recognized during the development of these design tables that the draft hood spillage tests performed on gas appliances do not adequately anticipate problems of connector design where headroom is limited. To reduce friction losses, and produce sufficient connector flow to prevent draft hood load spillage, a connector size increase often permits a vertical rise of 2 ft to function as effectively as 8 ft of the rise using the original draft hood size. Interconnections capable of spillage-free operation, may be successfully designed using this new dimension of approach, for nearly all types of structures.

For the analysis of the common vent, the arrangement of vent connectors was assigned a more than adequate fixed flow resistance. Both appliances were assumed to be on together. The common vent size was then computed for adequate capacity for the combined total input. This results in a set of common vent sizes and heights which are more than adequate, both at the full input and at less than the total input, when either appliance is on by itself. For proper vent operation then it is only necessary that the connectors conform to their specific requirements.

The basic arrangement of connector piping, used for computing the combined vent design tables, is shown in Fig. 2, which also indicates fundamental height dimensions of such systems. It can be seen that interconnection is made into a tee, and that each connection makes two 90 deg turns. In computing the allowable inputs to the common section, allowance was also made for the flow resistance of 90 deg elbow or tee. This permits applica-

* Let's Face Gas Venting—Paper presented at P.C.G.A.-A.G.A. Domestic Research and Utilization Conference, Los Angeles, March 23-24, 1954.

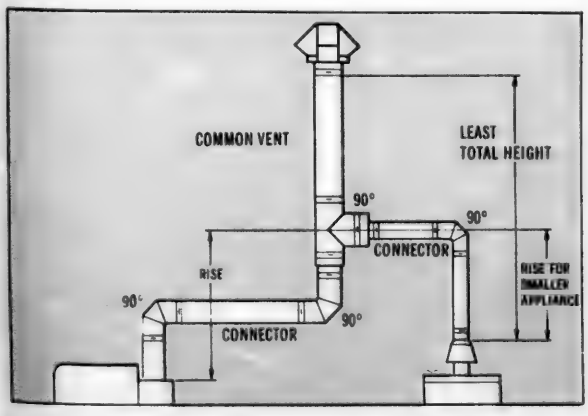


Fig. 2. Balanced vent installation—equal resistance in connectors.

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tion of the tables to multiple appliances connected to a horizontal manifold.

Rather than further describe the design factors considered in the development of the tables, they will be given as a commentary on the rules for application of the tables.

Combined Vent Tables

The combined vent tables were developed to take advantage of those materials possessing optimum characteristics as gas vent piping. Required characteristics of any gas vent pipe for best vent operation are as follows:

1. *Low thermal mass for rapid flow priming and fast heat up.* Because many modern gas appliances are controlled by heat anticipating controls, they may operate with very short on-cycles. The vent must prime and heat up quickly to minimize initial draft hood spillage.
2. *Insulated design for retaining heat in the vent gases, to assure stable flow and minimize condensation.* The density difference between hot vent gases and air is due solely to the waste heat delivered by the appliance to the vent system. The ability of the vent to operate without condensation, or without loss of draft, is a direct function of how effectively the vent piping insulation conserves this heat. It follows that use of insulated connectors is highly desirable to insure that the heat energy necessary for flow will reach the common vent section.

Traditional uninsulated flue materials such as masonry, terra cotta, or cement piping, are less able to maintain stable flow because they frequently permit excessive heat losses. Thus a key factor in successful combined vent design is the choice of a material specifically designed for gas venting, such as currently available types of double wall metal gas vent pipe.

Application of Combined Vent Tables

Steps in applying the combined vent tables to design of a simple gas venting system are as follows:

1. Locate equipment or appliances near vertical vent in structure so as to use short direct connectors with a minimum of turns. This is good practice to avoid costly fittings, as well as to prevent excessive frictional and heat losses in connectors. Successful combined vent operation requires adequate heat delivery to the common vertical vent.

TABLE 1 — VENT CONNECTORS

Vent Connector Requirements, Where Two or More Gas Appliances Are Vented Into a Common Vent or Into a Vent Manifold Using Double-Wall Insulated Type B Vent Pipe (U = 0.7 or Less)*

Draft Hood Outlet or Vent Collar Size, Inches	Vent Connector, Min. Requirement		Maximum Allowable Hourly (Btu per 1000) Rated Gas Appliance Heat Input to Vent Connector Size Shown on Left									
			Total Height of Vent, Feet, from Draft Hood to Top									
	Rise, Feet	Diam. Inches	6	8	10	12	15	20	25	30	40	50
3	1	3	22	23	24	25	26	28	30	32	34	36
	2		27	28	29	30	31	33	34	35	37	40
	3		31	32	33	34	35	37	38	39	42	43
	1	4	32	34	37	39	42	44	48	50	50	50
	2		41	42	44	46	48	50	50	50	50	50
	3		46	49	50	50	50	50	50	50	50	50
4	1	4	40	42	46	48	52	58	62	64	70	73
	2		48	51	54	58	61	65	68	71	75	80
	3		54	59	61	63	66	71	74	77	82	85
	1	5	56	62	65	68	73	79	84	88	92	95
	2		68	72	75	79	83	88	93	96	96	96
	3		76	81	85	90	92	96	96	96	96	96
5	1	5	67	72	76	80	87	96	103	109	118	123
	2		76	82	87	92	99	107	114	119	127	133
	3		86	92	98	103	109	118	124	129	136	141
	1	6	88	95	101	108	115	125	130	140	145	150
	2		103	110	116	121	127	135	145	150	150	150
	3		115	122	129	134	140	148	150	150	150	150
6	1	6	101	109	116	124	133	146	157	165	178	188
	2		113	123	131	138	147	161	171	180	195	200
	3		125	136	144	152	161	175	187	198	200	200
	1	7	125	134	141	149	157	172	183	191	200	200
	2		141	148	159	166	176	188	197	200	200	200
	3		157	165	172	179	187	197	200	200	200	200
7	1	7	150	163	176	190	211	245	262	290	290	290
	2		162	179	195	209	229	261	270	290	290	290
	3		174	192	210	228	254	290	290	290	290	290
8	1	8	196	213	230	248	276	320	342	380	380	380
	2		212	234	255	273	300	341	353	380	380	380
	3		227	251	275	298	332	379	380	380	380	380

* Tables 1 and 2 were copyrighted in 1956 by William Wallace Company.

2. Determine least total height of system from highest draft hood outlet vertically to position of termination. A termination located above the roof peak in accordance with the American Standard Z21.30, is recommended to obtain adequate common vent height and to avoid troubles from winds and from weak draft during summertime operation.
3. Making proper allowance for clearance to combustibles, locate the interconnection tee or manifold so as to secure maximum possible vent connector rise above the draft hood of each and every appliance. The importance of vent connector rise is sufficiently great to deserve special structural provisions in order to meet design conditions specified in the tables.
4. To find the right connector size of each appliance, enter Table 1 using the previously found least total height. Read down to appliance input rating or to next largest rating. This may be found in more than one place in the total height column (depending on draft hood outlet size). The draft hood outlet size shown on the left will indicate the proper heat input line to use. Having found this line, the required vent connector rise and corresponding connector size can be read on the left. Where the table indicates that the required connector must be larger than the draft hood outlet, install the increaser directly at the draft hood outlet, or as close as possible. Repeat the same process for the other connector, or connectors.
   Regardless of the outcome, do not use any connector smaller than that shown in the tables or smaller than the draft hood outlet. (Connectors may be reduced in size only when they can be made self-venting in accordance with procedures for individual vent design.)
5. For the common vent, add up appliance heat inputs to get the combined input to each section of manifold or common vent. To find the proper manifold or common vent diameter, enter Table 2 at the applicable least total height column, and read down to the size of common vent with an allowable input equal to or greater than the total to that common section. Use this size common vent.
6. Never use a common vent size smaller than the largest connector. The tables do not allow for the flow resistance of reductions at the point of interconnection. Note that this procedure, based on required flow capacity, can result in a common vent the same size as the largest connector, or equal to the sum of all areas.

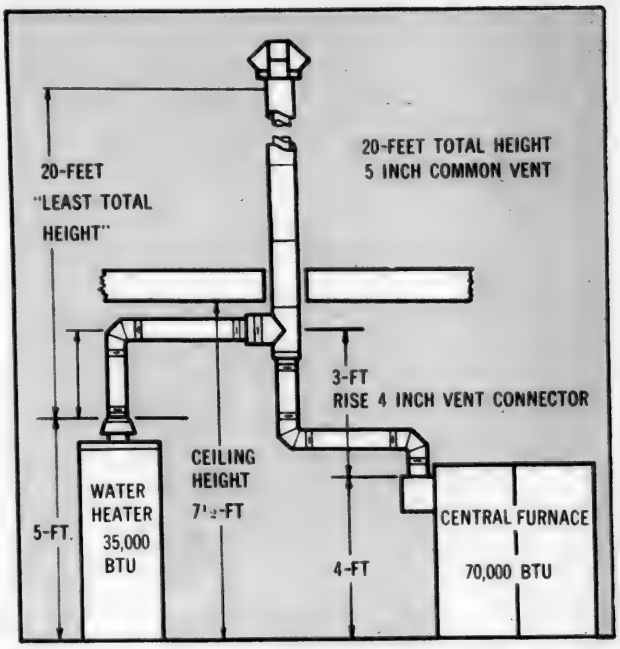


Fig. 3. Illustration of combined vent sample design problem.

It is apparent that no simple rule about combining areas is applicable here. Rule of thumb vent sizing such as 7500 Btu per sq in. should not be attempted. Effective vents designed in accordance with the methods given in this section will have a wide span of input levels.

A sample problem is now presented to illustrate how to use the combined vent tables. See Fig. 3.

In a location with a 90 in. ceiling height, a water heater rated at 35,000 Btu per hour, has a 3 in. draft hood outlet 60 inches above the floor. It will be interconnected with a central furnace of 70,000 Btu per hr input, with a 4 in. draft hood outlet 48 inches from the floor. These are to be vented into a common vent which will have a least total height of 20 ft above the water heater draft hood. It is assumed that the location of the top and vertical vent have been previously determined. Least total height, as shown in Fig. 3, is measured above the higher of the two draft hood outlets, when both appliances are at the same floor level.

TABLES 2—COMMON VENTS

Sizing of Common Vertical Vents and Vent Manifolds Using Double Wall Insulated Type B Vent Pipe (U = 0.7 or Less)

Manifold or Common Vent Size, Inches, Inside Dia.	Maximum Allowable Hourly Combined Heat Input of All Appliances Served By Each Section of Common Vent or Manifold									
	Total Height of Vent, Feet, from Draft Hood to Top									
	6	8	10	12	15	20	25	30	40	50
3	29	34	39	42	46	51	54	54	X	X
4	53	64	72	78	86	95	103	108	116	122
5	83	100	113	124	136	154	166	176	191	202
6	119	143	162	180	200	225	248	265	290	307
7	161	195	224	246	275	312	342	367	402	430
8	212	260	295	328	366	420	460	492	543	581
10	340	405	460	510	570	650	730	800	890	950
12	500	600	680	750	840	970	1070	1170	1300	1400

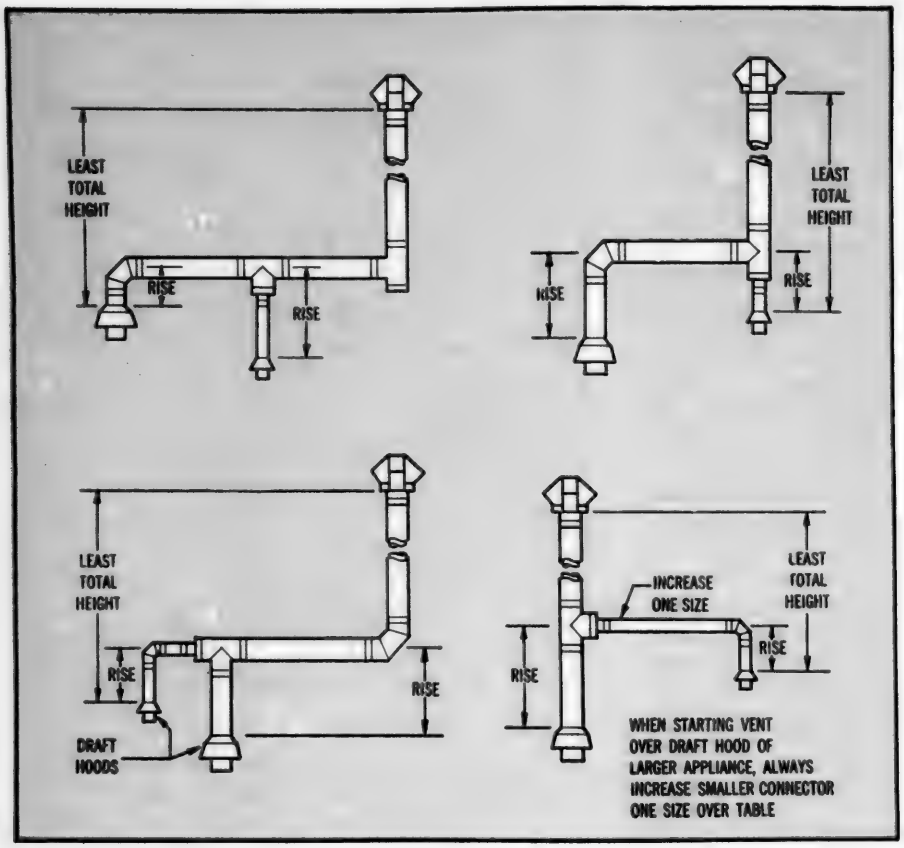


Fig. 4. Some other combined vent systems to which tables apply.

Procedure for Solution

Read down from 20 ft in the total height column of Table 1 to the first input equal to or greater than 35,000 Btu per hr for an appliance with a 3 in. draft hood outlet. In the third horizontal line, an allowable input of 37,000 Btu is indicated for a 3 in. size connector with 3 ft of rise. Unfortunately, however, only about 2 ft of rise can be obtained for the connector in this location. This is easy to see, because 90 in. ceiling height minus 60 in. draft hood height leaves only 30 in., and from this 2.5 ft it is necessary to deduct 4 in. or more to make allowances for fittings and clearances. This leaves only 27 in. or two ft of rise for all practical purposes, and means that it is necessary to read further on down the 20 ft height column.

In the fourth horizontal line, the Connector Table shows that a 4 in. connector with only one foot of rise will handle up to 44,000 Btu per hr. The size of water heater connector is thus found to be 4 in., and it needs at least one foot of rise.

For the central furnace connector, read down the 20 ft total height column in the same table to the line for a 4 in. draft hood outlet, and 4 in. connector having 3 ft of rise. The allowable heat input is 70,000 Btu per hr; thus a 4 in. connector will be satisfactory for attaching the furnace to the common vent.

Size of the common vent piping, and of the interconnection tee, is determined by choosing the smallest common vent for 20 ft "Least Total Height", which can carry a combined rated input equal to or greater than the total inputs of the two appliances, and in addition is at least as large as the largest connector. Read down the 20 ft total height column in the Common Vent Table to 154,000 Btu per hr. This indicates that the required size is 5 in. for the common vent.

Additional Hints to Help Apply Tables

1. *General*
   a. The method just illustrated in the sample problem will work for two, three, or any number of appliances connected into a common vent, or into a manifold at one floor level. Other combined vent systems to which these methods apply are sketched in Fig. 4.
   b. If the tables indicate that a combined vent will not work because of input, rise, or height limitations, try one or more of the following changes.
      (1) Increase the height of the common vent. Increase the vent height through the roof, or relocate the roof flashing so that the common vent passes through the roof at a higher level, as shown in Fig. 5.
      (2) Increase the size of the common vent. As an approximate rule, a one in. size increase over

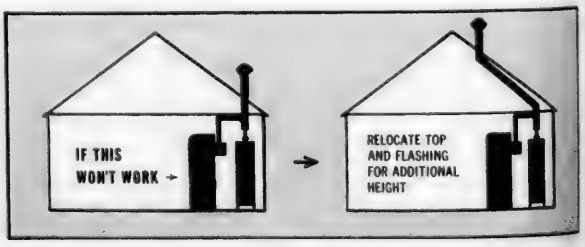


Fig. 5. Relocation of top to obtain proper combined vent design.

INDIVIDUAL VENTS PROVIDE GREATER RELIABILITY. MAY BE LESS EXPENSIVE
SHORT COMBINED VENTS MAY REQUIRE MANY FITTINGS, LARGE PIPING
6-FEET MINIMUM

Fig. 7. Individual vents may be preferable to low height combined vent.

the common vent size called for in Table 2 will decrease the required connector rise by 6 to 12 inches. This provision results in reduced friction losses, but since such losses become practically negligible with one size increase, further increases produce little benefit.

(3) Check the part of Table 1 showing use of a larger size connector. A connector two in. larger than the draft hood outlet will handle more input, or permit a further reduction in required rise.

(4) Increase the connector rise. This may be accomplished by a slight appliance relocation, by raising the interconnection tee, by minor structural changes, or by running all connectors through to the next floor or into an unoccupied attic, as shown in Fig. 6.

(5) Use individual vents for each appliance, as shown in Fig. 7.

c. The values in the tables may be used to estimate inputs for in-between heights, or rises. For example, at 35 ft total height, a 4 in. connector on a 4 in. draft hood outlet will have an allowable input midway between 64 and 70 thousand Btu per hr., for a 1 foot rise, as shown in the Table. The same thing can be done for in-between connector rises.

d. Since proper connector rise is necessary for all appliances, lateral manifolds should not be sloped if the rise of individual connectors is reduced thereby. Although required by many codes, the pitch or slope of manifolds and connectors does not serve to improve actual venting. The connector produces draft more effectively than the common vent because it operates at a much higher temperature. Thus one ft of added connector rise may be more beneficial than 6 to 12 ft of additional common vent height.

For example, a manifold may have such an extreme slope that the appliance farthest from the common vent has insufficient connector rise and becomes liable to severe draft hood spillage. If such manifolds are required to have a slope, be sure that all connectors have a minimum rise in accordance with the tables.

Fig. 6. Relocate tee into attic for more connector rise.

e. When one or more appliances are connected into an individual vent system at a later date, the entire system must be redesigned as a combined or multiple vent, making proper allowances for all heat inputs, connector rises, and other factors. In an individual vent, connector rise or orientation has no bearing on its operation. But in a combined vent, connector rise is all important.

f. For combined vents to be installed at elevations of 2000 ft or more, design the connectors and common vent as if the operating input of each appliance had been increased 5% for every 1000 ft of altitude above sea level.

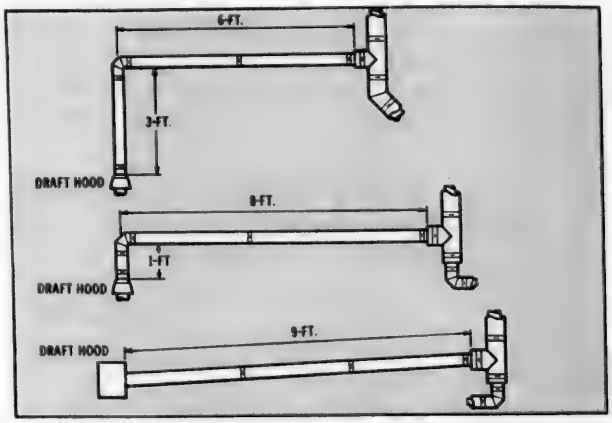


Fig. 8. Determining maximum allowable connector length.

For Example: The connector of an appliance rated at 100,000 Btu at 5000 ft elevation, should be designed for a capacity of 1.25 × 100,000 or 125,000 Btu at 5000 ft elevation. This compensates for the greater volume of gases which may be produced at decreased atmospheric pressure.

2. *Appliances*

a. Tables 2 and 3 apply to design of vents for any type of vented gas appliance having a draft hood.

b. For any gas appliance having a draft hood, the vent must be sized on the basis of the rated nameplate heat input. A reduction in operating input of an appliance does not affect its connector or common vent size requirements. This is based on the air handling volume of a gas appliance, which obtains combustion air by gravity flow. This air flow does not change with adjustments in fuel input.

3. *Connectors*

a. To conserve the valuable heat in the vent gases, use double-wall insulated piping for all connector piping between the appliance and the common vent.

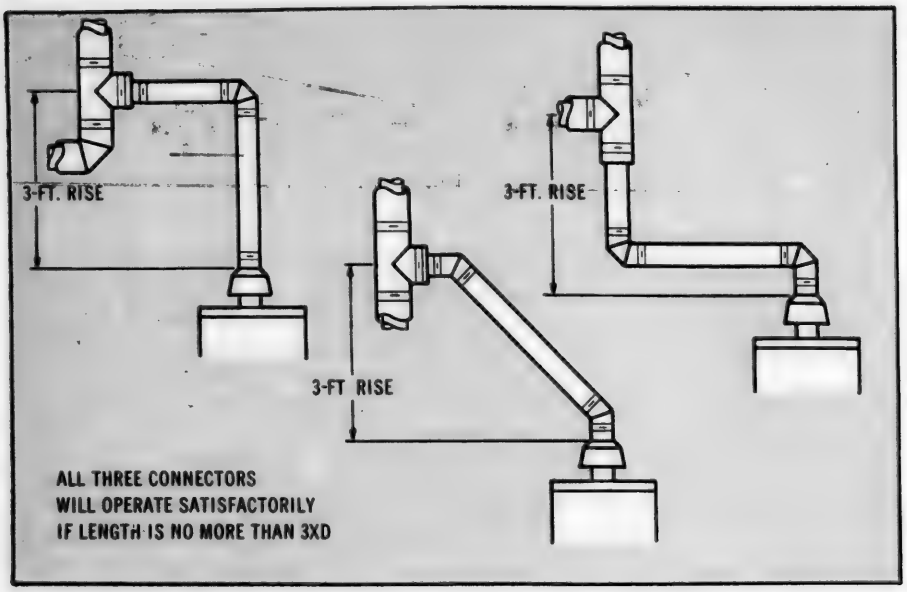


Fig. 9. Connector rise is determined by difference in elevation between draft hood and tee.

Fig. 10, below. Use extra ceiling height to obtain better vent operation.

The tables apply only within certain limits of heat and friction losses in connectors. Optimum vent operation thus requires reasonable limits of length and heat losses in connectors. For vent connectors having a rise of 4 ft or less, Fig. 8 shows how the maximum allowable connector length is determined.

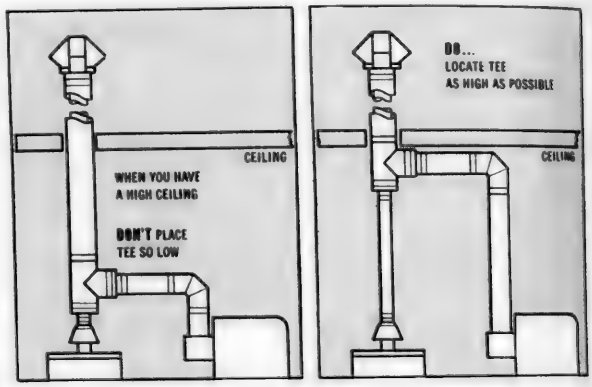
Allowable Connector Lengths

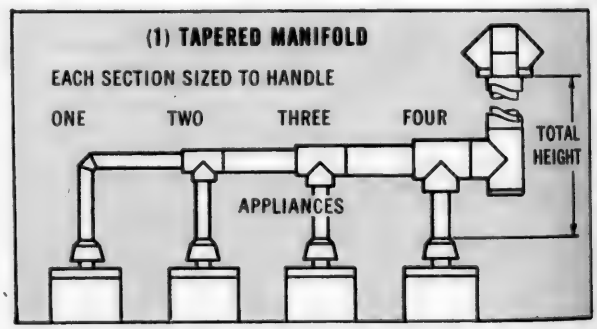
Connector Size, Inch Diameter	Double Wall Air-Insulated Metal U = 0.7 or less Length, Feet
3	9
4	12
5	15
6	18
7	21
8	24

The undesirable practice of using uninsulated or single-wall connectors in attics, crawl spaces, garages, and other unheated areas, is permitted in most venting codes. These materials allow excessive heat loss and may cause condensation, leading to poor venting and possible ultimate vent material failure from corrosion as well as damage to property. For these reasons, uninsulated vent connectors should not be used on any gas appliance having a draft hood.

b. Providing that connector rise and length requirements are met, as shown in Fig. 9, it does not matter if the connector goes vertically, then laterally; or laterally, then vertically; or is sloped between draft hood and the interconnection. Requirements in many codes for connector pitch, and an initial vertical run are hints that connector rise is important. But once the rise requirement in these tables is met, the connector will operate properly and not cause spillage regardless of whether it is pitched or part is horizontal.

c. Connectors should be installed with not more than two 90 deg turns, including the final turn into the vent. The basic combined vent diagram Fig. 2 shows a water heater connector having two 90 deg





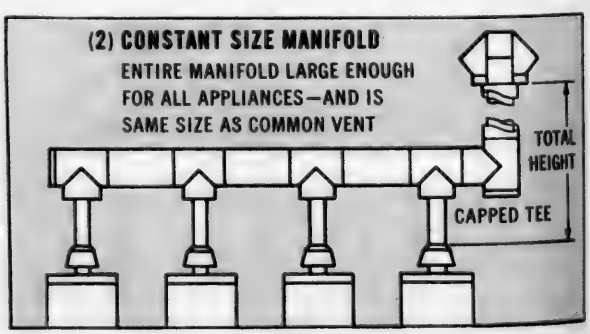


Fig. 11. Alternate procedures for sizing vent manifolds.

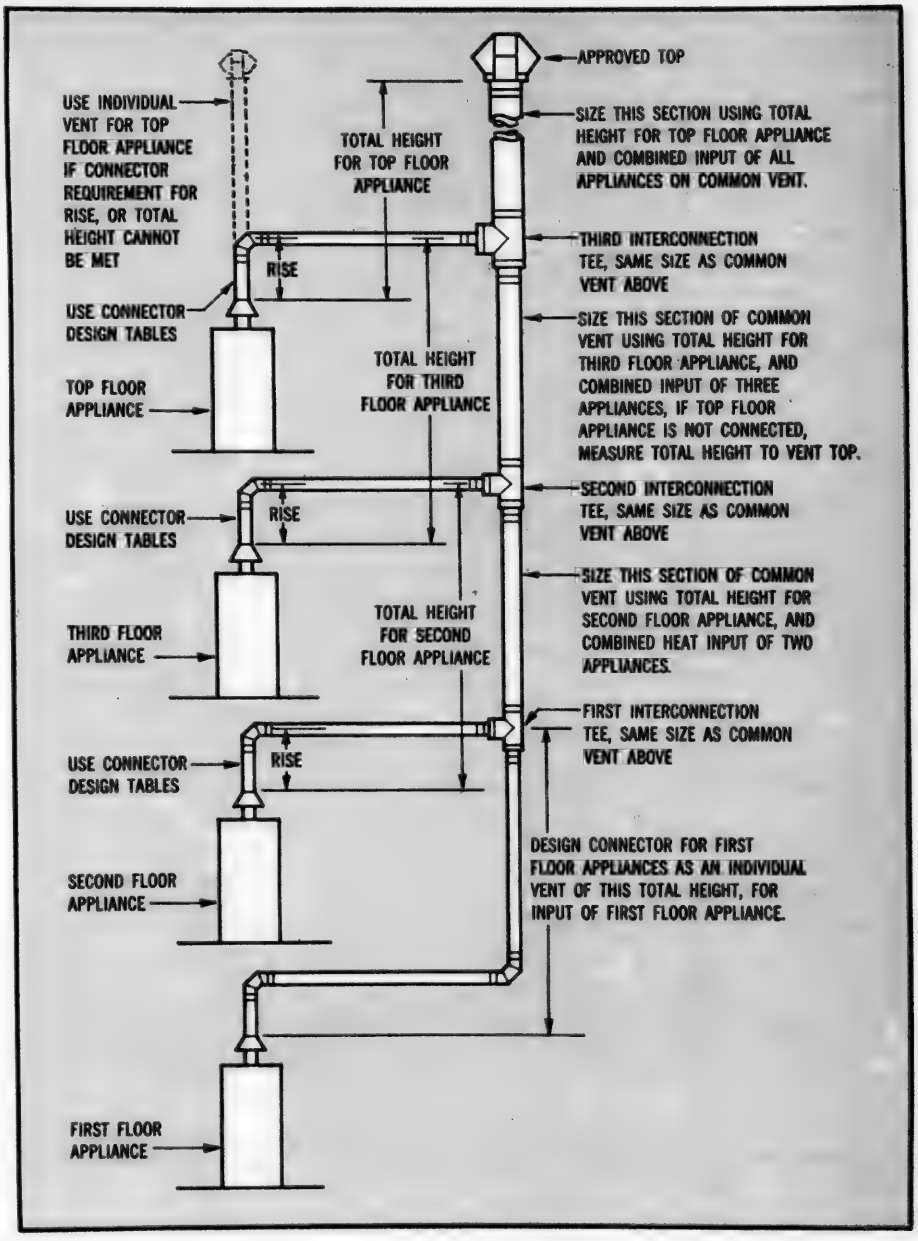

APPROVED TOP
USE INDIVIDUAL VENT FOR TOP FLOOR APPLIANCE IF CONNECTOR REQUIREMENT FOR RISE, OR TOTAL HEIGHT CANNOT BE MET
TOTAL HEIGHT FOR TOP FLOOR APPLIANCE
SIZE THIS SECTION USING TOTAL HEIGHT FOR TOP FLOOR APPLIANCE AND COMBINED INPUT OF ALL APPLIANCES ON COMMON VENT.
THIRD INTERCONNECTION TEE, SAME SIZE AS COMMON VENT ABOVE
RISE
USE CONNECTOR DESIGN TABLES
SIZE THIS SECTION OF COMMON VENT USING TOTAL HEIGHT FOR THIRD FLOOR APPLIANCE, AND COMBINED INPUT OF THREE APPLIANCES, IF TOP FLOOR APPLIANCE IS NOT CONNECTED, MEASURE TOTAL HEIGHT TO VENT TOP.
TOTAL HEIGHT FOR THIRD FLOOR APPLIANCE
TOP FLOOR APPLIANCE
SECOND INTERCONNECTION TEE, SAME SIZE AS COMMON VENT ABOVE
RISE
USE CONNECTOR DESIGN TABLES
SIZE THIS SECTION OF COMMON VENT USING TOTAL HEIGHT FOR SECOND FLOOR APPLIANCE, AND COMBINED HEAT INPUT OF TWO APPLIANCES.
TOTAL HEIGHT FOR SECOND FLOOR APPLIANCE
THIRD FLOOR APPLIANCE
FIRST INTERCONNECTION TEE, SAME SIZE AS COMMON VENT ABOVE
RISE
USE CONNECTOR DESIGN TABLES
DESIGN CONNECTOR FOR FIRST FLOOR APPLIANCES AS AN INDIVIDUAL VENT OF THIS TOTAL HEIGHT, FOR INPUT OF FIRST FLOOR APPLIANCE.
SECOND FLOOR APPLIANCE
FIRST FLOOR APPLIANCE

Fig. 12. Principles of design of multi-story vents using vent connector and common vent design tables.

turns. Where a third 90 deg turn is necessary, use the next larger diameter of connector, or increase the connector rise two ft.

d. Using more connector rise than the amount called for in the tables, still improves vent operation. Any extra ceiling height, as in Fig. 10, may make possible a reduction in connector size. Although the tables show only 1, 2, or 3 ft of rise, they may readily be extended to 4 ft of rise. For example, in a combined vent system of 12 ft total height, a 3 in. connector on a 3 in. draft hood, and having 4 ft of rise, should be able to vent any 38,000 Btu per hr appliance.

4. *Interconnections and Manifolds*

a. Connectors may be joined to manifolds and vertical vents using standard, commercially available tee fittings. The factors given in these tables are chosen to assure safe operation with such fittings. This eliminates the need for specially designed interconnection fittings. All such interconnection fittings should be the same size as the common vent for the combined input.

b. Manifolds for two or more appliances may be sized using either of two procedures, as indicated by Fig. 11.

(1) Use total heat input to the particular portion of manifold under consideration.

(2) Determine the required size of the final section of manifold based on total input, and use this size for the entire manifold. This avoids the use of a tapered manifold, and may reduce cost by eliminating many increaser fittings.

c. Connectors from individual appliances may enter a manifold from the side, at an angle, or from below, depending on appliance location and the most convenient piping arrangement.

5. *Common Vent Piping*

a. The minimum least total height of a combined vent

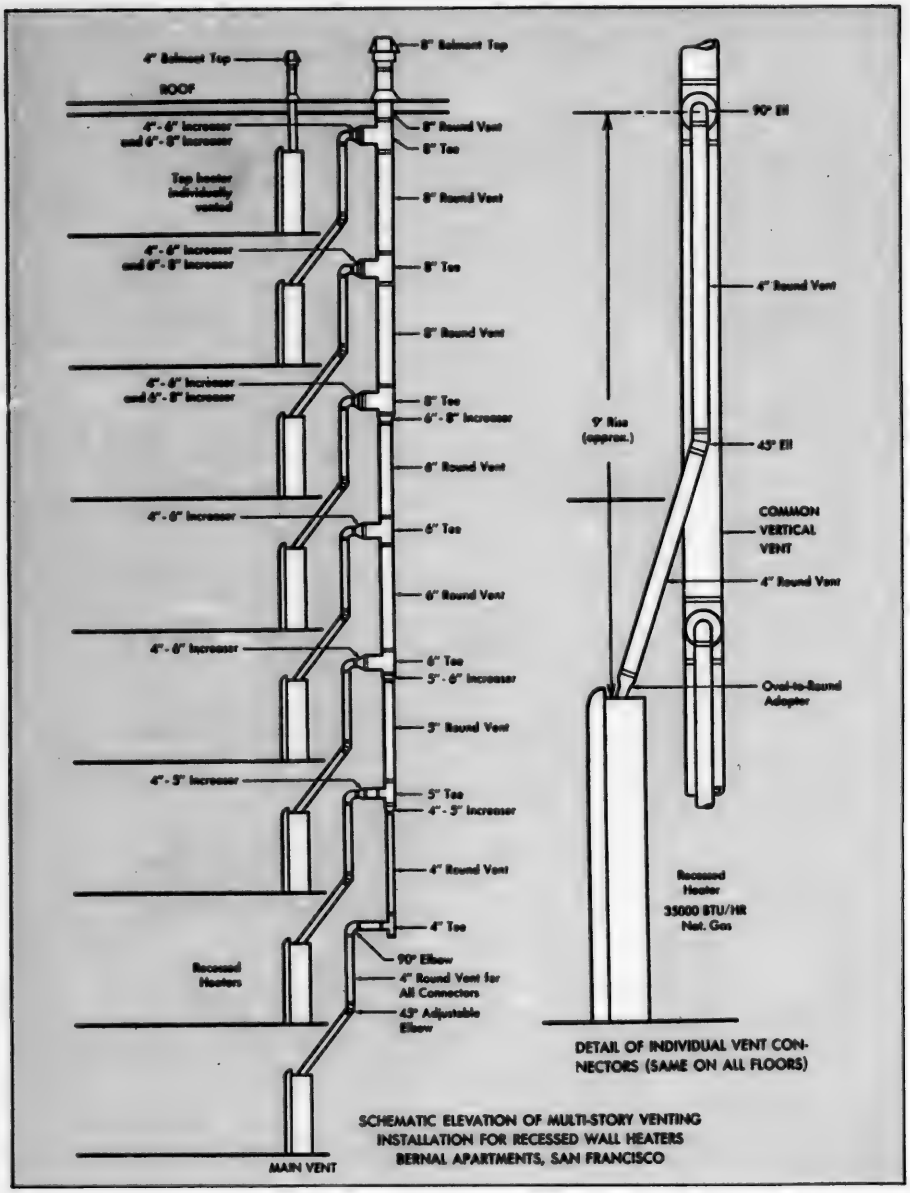


Fig. 13. Multi-Story gas vent using self-venting connectors.

system should not be less than 6 ft. At this low height, individual vents usually offer better reliability, more stable flow, and greater ease of installation. Combined vents of less than 6 ft of total height are likely to cause much draft hood spillage due to their inability to produce adequate flow.

b. The common vent should be equal to or larger than the largest size of connector entering it. when the connectors are sized in accordance with these tables.

c. Any section of common vent, between the last connector entering it and the top, may have one 90 deg or two 45 deg turns. Tabulated common vent diameters allow for the flow resistance of a tee or elbow used to connect a manifold to the vertical section. If more turns or fittings are used—such as an additional attic offset, use the next size larger common vent and fittings.

Multi-story Vents

Thus far, only single floor vent systems, having two or more appliances at a given level, have been designed. But the general method can be extended to include appliances at multiple levels on a common stack, or to manifolds at multiple levels.

Modern insulated gas vent piping has demonstrated conclusively that properly designed multi-story vents will function safely without draft hood spillage or hazard.

It is logical to assume that appliances on a multi-story vent would be individually controlled. Thus the vent should function properly for any one, for any combination, or for all appliances in operation. The most critical vent operating condition again exists during firing of any one appliance on a multi-story stack. This is the same as for any other combined vent. Thus it is necessary to divide the overall system into smaller, simple combined vent systems, each with a minimum least total height, and the minimum common vent height. For an appliance at any floor, the least total height becomes the sum of its connector rise plus the height of common vent between interconnections. No credit is given for the extension of the common vent beyond the next interconnection.

The way to divide a multi-story vent into simple com-

bined vent systems is shown in Fig. 12. This sketch illustrates the major principles of these multi-story instructions and should be given close and careful study. As with simple combined vents, it follows from this approach that every vent connector, going from the appliance, to the vertical common vent, must be designed in accordance with the vent connector table. Similarly, for sizing of manifolds and the vertical stack section, the common vent table must be used. Each section of vertical common vent must be large enough to carry the accumulated total input of appliances discharging into it.

The gas vent connector section from lowest appliance to the common vent is readily designed as an individual vent terminating at the first tee or interconnection. The second lowest appliance is considered to have a combined vent which terminates at the second interconnection, and so forth. The top floor appliance has a total vent height measured to the outlet of the common vent. All appliances at intermediate levels have a total height which is equal to the sum of their connector rise plus the distance between interconnections. Using these heights, in conjunction with appliance inputs, will permit the designer to choose appropriate sizes of connectors and common vents. There is no limit to the height of such a system, provided that common vent size is increased as required. It may occasionally prove to be more economical, however, to divide a high building into separate upper and lower systems to avoid the use of extremely large size vents.

A conservative approach to design of multi-story vents requires the use of completely self-venting connectors as shown in Fig. 13. The vertical connector rise necessary to achieve self-venting is attained by running each connector through the floor and up 8 or 9 ft to just below the ceiling level of the next floor above. This self-venting connector method of installation is much more costly, as it takes more interior floor space, more vent fittings, and more installation time. Systems using self-venting connectors should have great stability; however, they offer no important operating advantages over the preferred method of using connector size increases as specified in the tables previously given.

Reviewing, and summing up, a general method of combined-multi-story vent design has been presented, which can be used on conjunction with standard, approved, commercially available double-wall insulated gas vent materials. In addition, this comprehensive design method can form the nucleus of a general code for gas vent installation in buildings. It translates scientific theory into a simple set of rules and numbers, which when applied and enforced, will reduce the probability of vent malfunction to an absolute minimum.

In developing a code for good venting, based on these tables, it is both illogical and impractical to pick and choose portions of these instructions and still arrive at a workable end-product. These tables, rules, and vent material performance requirements, form an integrated, intermeshing system. All are essential—none can be left out. Success can not be achieved by ignoring required connector rises and length limits—nor by overlooking the need for a size increase in connector or common vent should the tables show it is necessary. Failure of venting codes to recognize the advantages of those gas vent materials which effectively conserve heat, will also hinder advances toward better venting.

Progress demands a break with the past. These tables now provide a strong and lasting foundation on which to design venting systems. The principles of combined vent design have been thoroughly laboratory-tested. The fundamental equations of combined vent operation used for the tables have been verified by an independent research organization. Lastly, for over two years, combined and multi-story gas vents have been designed, using the tables in the field, with uniform success.

United Nations Report Notes Surge in World's Fuel Output

Between 1929 and 1956, the world's output of fuel more than doubled. The May issue of the United Nations Bulletin of Statistics, reporting this, added that the rise was accompanied by a marked change in the sources of energy.

Solid fuels accounted for more than three-quarters of the global supply in 1929, the publication said, but last year contributed only slightly more than 50 per cent. By comparison crude petroleum, which made up only 15 percent of the output in 1929 now had a 30 percent share.

During the last few years, the bulletin said, solid fuels (mainly hard coal) have remained by far the most important single source of energy. Expanded production of both lignite and hard coal in the Soviet Union, mainland China, and Eastern Europe has been largely responsible, it added.

These countries, the statistics show, are now responsible for nearly one-third of the total world production of coal, as contrasted with only one-eighth in 1929. World output rose by only 27 percent from 1929 to 1956, while that of the "centrally planned economies" advanced by 225 percent.

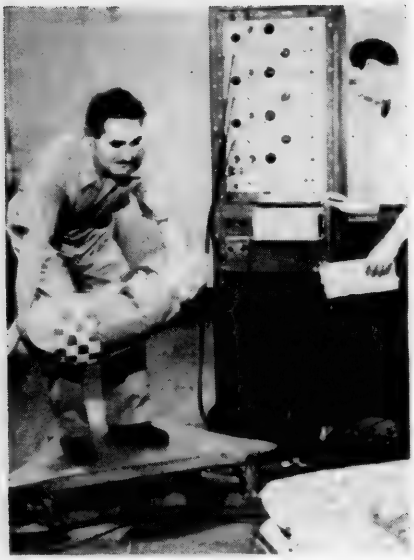
American Pick-up Noted

North America and Western Europe are the two other major coal-producing regions, and together with the Communist countries, account for more than 90 percent of the world's output. Between 1954 and 1956, the bulletin said, North American output of coal increased more than 25 percent, as a result of increased domestic industrial activity and growing European demand.

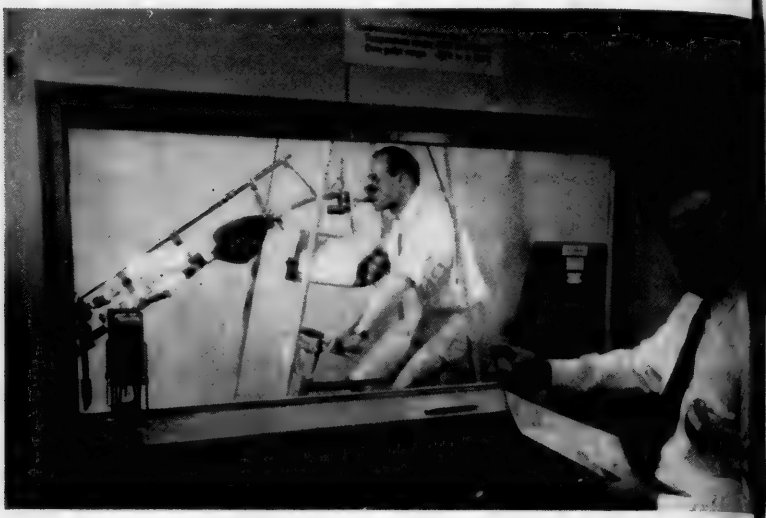
Although world output of all forms of fuel doubled between 1929 and 1956, that of crude petroleum (including natural gasoline and shale oil) quadrupled. The largest producer of crude petroleum remains North America, which increased output 175 percent in the period.

The most remarkable upsurge of oil production, however, was reported for the Middle East. It rose from 6,000,000 metric tons in 1929 to 171,000,000 metric tons in 1956, for a 20 percent share of the global volume.

Picture Paragraphs

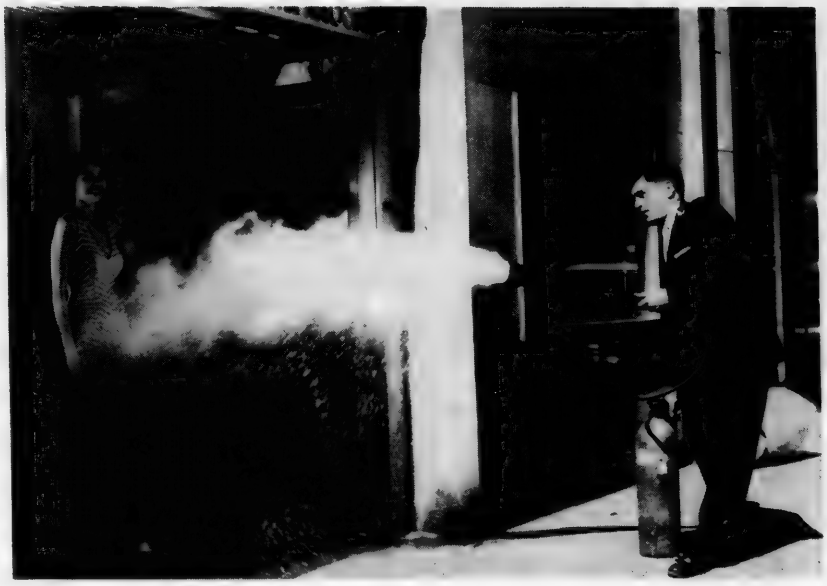


TEST LAB FOR HUMANS. At DuPont's Haskell Laboratory for Toxicology a Industrial Medicine, one of the four existing Lauru platforms is located. T research device, at left, is used to study task performance by sensing reacti on quartz crystals which function similar to a phonographic pick-up. Moveme of the platform exerts pressure on six crystals, and the impulses are magnifi and relayed to the recorder. Shown below is a view through vision panel in d of the laboratory's two air conditioning test rooms. One room is designed maintain a dry bulb temperature from 40 to 120 deg F, and from 20% to 9 relative humidity. The other room is designed for regulating dry bulb tempe ture between —10 and 200 deg F with dew point from —10 to 110 deg. T rooms are arranged similar to a wind tunnel in that air velocities up to 20 can be maintained past the subject. An employee is seen riding a station bicycle and reaction test data is recorded outside the room. With the use these facilities, data are being developed which will contribute to the impro ment of working environment and reduction of fatigue for a given job.



DRIVE-IN AIR CONDITIONING. Suspended out of the way whe in use, the flexible ducts, above, provide air conditioning for dr customers at the Blue Onion, a Las Vegas, Nev., restaurant. The esta ment utilizes equipment from Carrier Corporation to provide instan conditioning to any car driving into one of the 30 parking stalls a as to the restaurant itself. In addition to providing cooling comf customers under the intense Nevada summer sun, the system furnishes air in winter. At left, Lew Hogan, engineer for Western Heating & tilating who designed the system, tests the installation. Air is delivere cars through 6-inch rubberized flexible duct, terminating in special signed boot which directs air over heads of customers.

SPEAKING OF INVISIBLE SHIELDS. Not a toothpaste ad but rather a demonstration of Sulzer Bros.' Doorless Door is the photo at right. Installation at Knickerbocker Federal Savings and Loan Association's New York office protects and insulates interior of building against all outside weather conditions. Snow, created by release of carbon dioxide from fire extinguisher, is deflected by continuous downward flow of air.



FUSELAGE TEST SECTION. Aircraft mechanics at Convair Division of General Dynamics Corp., San Diego, Calif., assemble a full size, 20-ft long section of fuselage for new 615 mph Convair 880 jet transport. This section will be used to test the cabin air conditioning system and soundproofing. To test heating system, fuselage section will be subjected in cold chamber to sub-zero temperatures characteristic of atmosphere up to 40,000 ft. Exposure to typical summer ground temperatures will prove effectiveness of aircraft's air conditioning system.

MOBILE POWER PLANT. This 5000-kw railway mounted gas-turbine power plant, designed and built by Westinghouse Electric Corp. for the U. S. Army Engineers has recently logged well over 5000 hours of operating time at Fort Meade, Md. The first car of the two 54-foot long railway cars contains the 5000-kw turbine-generator unit with exciter, a 150-hp wound rotor starting motor, and turbine auxiliary control panels. The second car contains a 6250-kva outdoor transformer, a 150-kw diesel generator unit, a 50-kw diesel generator unit, a 30-kva transformer, high and low-voltage switchboards, remote turbine control panel, and auxiliaries such as air-conditioning equipment, heaters, batteries, and a 4-kw axle driven generator.

Problems in Cooling with Gas

REX T. ELLINGTON
Assistant Research Director, Institute of Gas Technology

In an effort to further the development of absorption cooling, where gas-fired apparatus has long been important, American Gas Association, through its Promotion-Advertising-Research (PAR) Plan initiated research on absorption cycles and the properties of absorbent-refrigerant combinations. Project ZB-8, conducted at the Institute of Gas Technology (I.G.T.) during 1955, was part of that effort.

Presented are excerpts from a report on that project, presented at AGA's Research and Utilization Conference, May 7-9, in Cleveland, Ohio. Because he discovered a dearth of literature on the thermodynamics of the absorption cooling cycle, the author summarizes the theory first, then discusses some of the practical problems encountered in the search for proper absorbent-refrigerant combinations.

THE operation of the absorption cycle is often misunderstood because chemical processes are substituted for the purely mechanical process in the familiar compression cycle. In both of these cycles the usable cooling effect is obtained by using heat from the treated air stream to boil a refrigerant material in a heat exchanger, or evaporator. The evaporator must operate in the temperature range of 35-50 deg F, for air conditioning, to obtain reasonable air circulation rates and prevent frosting of exchanger surfaces. This and other operating condition restrictions make the selection of materials for use in these cycles a difficult task.

The absorption cycle utilizes two fluid streams, in a totally enclosed system: the refrigerant provides the cooling effect; and the absorbent is used to move the refrigerant around part of the cycle (Fig. 1). The system is composed of the following major components: generator, condenser, evaporator, absorber and a liquid-liquid heat exchanger. The refrigerant passes through all units while the absorbent is confined to movement through the generator, heat exchanger and absorber.

A mixture of absorbent and refrigerant is heated in the generator to boil off most of the refrigerant, which passes to the condenser. The generator and condenser operate at relatively high pressure, so that the condensing temperature of the refrigerant is sufficiently high to permit rejecting heat to outside air or cooling water.

The refrigerant is then throttled to lower pressure so that it will boil at relatively low temperature in the evaporator and thus absorb heat from the air or water to be cooled. The vaporized refrigerant passes to the absorber where it dissolves in cooled strong absorbent solution which is then pumped back to the generator to continue the process.

Since the absorption process takes place in a closed system, no work is done on the system by external mechanical forces when material is returned to the generator by gravity rather than by pump. In such a case, energy can enter or leave the system only by flow of heat. This is the basic difference from cycles in which mechanical energy is used to compress the refrigerant. Furthermore, in the absorption cycle the refrigerant material is liquefied and vaporized twice during the cycle as compared with once in the mechanical compression cycle. The additional vaporization and condensation are necessary to substitute chemical processes for the mechanical compressor. Thus, the generator and absorber perform the same function as the compressor by taking low pressure refrigerant vapor from the evaporator outlet and delivering high pressure vapor to the condenser inlet.

General Analysis of an Ideal Cycle

In analyzing the absorption cooling cycle, it is convenient to consider a simplified closed system consisting of a generator, condenser, evaporator and absorber, which have the same operating features as those described in Fig. 1. To discuss the cycle let (Fig. 2):

Q_1 = heat absorbed in evaporator at an absolute temperature of T_1 and pressure of P_1.

= latent heat of vaporization of refrigerant.

Q_2 = heat removed from condenser at T_2 and P_2.

= latent heat of condensation of refrigerant.

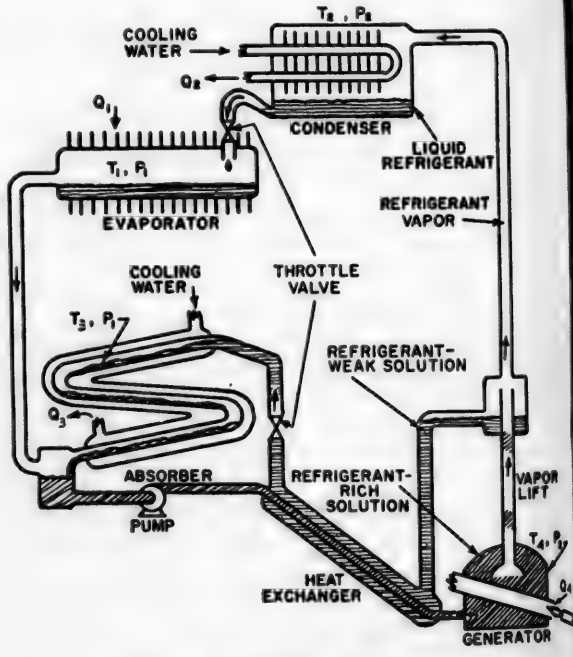


Fig. 1. Basic absorption cooling cycle.

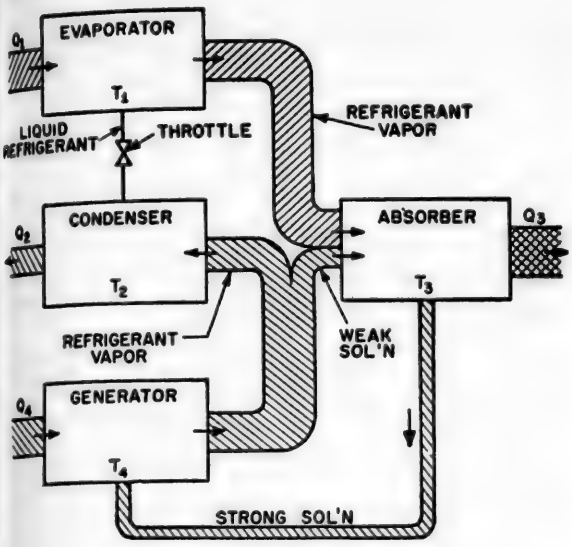


Fig. 2. Energy Flow in a simple absorption cycle.

Q_3 = heat removed from absorber at T_3 and P_3.

= latent heat of condensation of refrigerant plus heat of solution, plus sensible heat of weak solution.

Q_4 = heat furnished to generator at T_4 and P_4.

= latent heat of vaporization of refrigerant plus sensible heat of solution.

The coefficient of performance of such a system may be defined as the ratio of the cooling effect obtained to the energy expended to secure this effect, i.e., refrigeration by the evaporator to heat input to the generator: C. O. P. $= Q_1/Q_4$. By comparing the heat quantities in the absorption cycle and the energy quantities in the compression cycle, thermodynamic analysis shows that the C. O. P. can be related to the temperatures in the various units as follows:

$$C.O.P. = Q_1/Q_4 = T_1(T_4 - T_3)/T_4(T_2 - T_1) \quad (1)$$

The coefficient of performance is sometimes called the *thermal efficiency* of an absorption cycle.

Equation (1) shows that the coefficient of performance increases with increase in the ratio of absolute temperature of the evaporator to that of the generator. Furthermore, it is apparent that it is desirable to have a large temperature difference between the generator and absorber and small temperature difference between the absorber and the condenser. The effect of a change in the operating temperature of any particular unit in the absorption system on the coefficient of performance is shown in Table 1 for the conditions noted. This table shows quantitatively the desirability of high generator and low absorber and evaporator temperatures, and that the evaporator temperature should be as high as is consistent with good operation.

Analysis of Specific Cycles

Analysis of an ideal cycle is helpful in establishing desirable operating conditions. However, to determine the actual heat quantities that would be involved in the individual processes, it is necessary to analyze the cycle in greater detail and to use estimated or actual thermodynamic properties of the refrigerant and the absorbent solution. These calculations can be illustrated by using basic thermodynamic data on the materials involved. If a basis of one pound of refrigerant circulated through the system per unit time is taken, then the conditions throughout the cycle may be given in terms of unspecified temperatures, pressures and concentrations (Fig. 3).

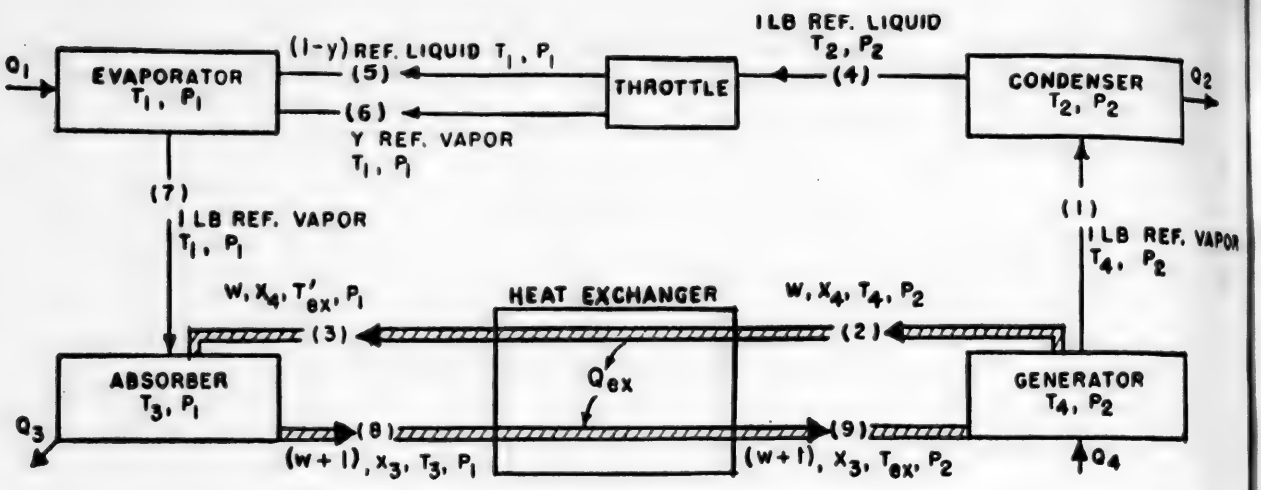
For example, the heat input to the generator plus the heat of dilution of the absorbent from concentration x_4 to x_3 must equal the latent heat of vaporization of the pound of refrigerant and the sensible heat to bring the solution from heat exchanger outlet temperature to generator temperature. The heat of dilution is the heat effect resulting from mixing the pound of refrigerant, as a liquid, with the requisite amount of absorbent, at the same temperature. The heat input to the generator can be calculated from a heat and material balance (Fig. 3) around the unit and is equal to the difference in enthalpies of the entering and leaving streams, based on the pound of refrigerant. Enthalpies may be used since the temperature, pressure, concentration and mass of each stream define its heat content.

This immediately shows the usefulness of thermodynamic charts, such as the enthalpy-concentration diagram (Fig. 4) in helping the engineer make accurate cycle calculations and determine rapidly the effect of proposed changes in operating conditions. The enthalpy of a stream in the cycle is a point function, i. e., it is determined by the conditions of the stream and not its history. Therefore, solution of the heat and material balances of Fig. 3, can be obtained by graphical means on the enthalpy-concentration (H-X) chart, and Fig. 4 shows how such a solution is made.

TABLE 1—EFFECT OF CHANGE IN OPERATING TEMPERATURE OF A COMPONENT ON THE COEFFICIENT OF PERFORMANCE OF AN IDEAL ABSORPTION REFRIGERATION CYCLE.

Component	Assumed operating Temp. deg F	Change in C.O.P. for an increase in temperature of 1 deg F	
		Absolute Change	Percent Change
Evaporator	50	+.0213	+1.8
Condenser	110	—.0191	—1.7
Absorber	85	—.0135	—1.2
Generator	170	+.0117	+1.0

For example, Fig. 4 shows the solution of cycle calculations for an ammonia-water system, with hydrogen present as an inert diluent. The operating conditions assumed are: 90 deg condenser and absorber, 40 deg evaporator, and a maximum system working pressure of 180 psia. The composition of the stream leaving the condenser is determined from the diagram, at the intersection of the 180 psia saturated liquid line and the 90 deg operating temperature, to be 99% ammonia (Point *A*, Fig. 4). A trial and error solution is used to obtain the composition of any liquid remaining in the evaporator. This is found to have a vapor pressure of 5 psia. Then the stream leaving the evaporator is assumed to be in equilibrium with the stream going to the generator. At 90 deg and 5 psia partial pressure, the stream to the



HEAT AND MATERIAL BALANCES:

$$Q_1 = h_7 - (1-y)h_5 - yh_4 = (1-y)h_{fg,\,T_3}$$
$$-Q_2 = h_4 - h_1 = -h_{fg,\,T_2} - C_{p,\,v}(T_4 - T_2)$$
$$-Q_3 = (w+1)h_8 - h_7 - wh_3 = -h_{fg,\,T_3} - \Delta h_{T_3} - wC_{p_3}(T'_{ex} - T_3) + C_{p,\,v}(T_3 - T_1)$$
$$Q_4 = h_1 + wh_2 - (w+1)h_9 = (1+w)C_{p_3}(T_4 - T_{ex}) + h_{fg,\,T_4} - \Delta h_{T_4}$$
$$q_{ex} = w(h_3 - h_2) = (w+1)(h_9 - h_8) = wC_{p_4}(T_4 - T'_{ex}) = (1+w)C_{p_3}(T_{ex} - T_3)$$
$$\text{Throttle: } (1-y)h_5 + yh_5 - h_4 = 0 = yh_{fg,\,T_1} - C_{p_1}(T_2 - T_1)$$

NOMENCLATURE:

C_{p_1} = means specific heat of refrigerant liquid, Btu/(lb) (deg)
$C_{p,\,v}$ = mean specific heat of refrigerant vapor, Btu/(lb) (deg)
C_{p_3} = mean specific heat of absorbent solution, concentration x_3, Btu/(lb) (deg)
C_{p_4} = mean specific heat of absorbent solution, concentration x_4, Btu/(lb) (deg)
h_i = enthalpy of i^{th} stream/lb fluid, Btu/lb
$h_{fg,\,T_1}$ = heat of vaporization of refrigerant at T_1 and P_1, Btu/lb
Δh_{T_1} = heat of dilution of w x_4 solution to (w+1) x_3, at T_1, Btu
p_1 = low side pressure, psia
p_2 = high side pressure, psia
T_1 = temperature (absolute), deg R
w = weight of absorbent solution, lb
x_3 = lb absorbent/lb solution, weak in absorbent
x_4 = lb absorbent/lb solution, strong in absorbent
= weight of refrigerant flashed at throttle valve, lb

Fig. 3. Schematic diagram of heat and material balances for simple absorption cycle.

generator is found to be 15% ammonia, point *D*. The lengths of the various construction lines are used with the lever rule to find the weight of each stream, and proper construction procedures give their enthalpies. The results of the calculation are summarized in Fig. 5.

The upper curves on the H-X chart give the properties of the saturated refrigerant vapor in equilibrium with the saturated absorbent liquid, whose properties are given by the lower curves. The set of curves between those mentioned are drawn in to facilitate graphical problem solutions. For other systems the chart also shows conditions under which solids may form and prevent proper operation. Preparation of thermodynamic charts requires complete thermodynamic information on the absorbent-refrigerant combination under consideration and for this reason few charts have been prepared. However, these properties can be estimated with sufficient accuracy from certain basic fragmentary data to merit their preparation in this manner until more extensive and reliable data are available.

A lithium bromide-water combination is one of the best yet employed in absorption systems. An enthalpy-concentration chart was prepared for this combination. It is now available to engineers considering this combination.

Properties of Absorbent-Refrigerant Combinations

While the efficiency of an ideal absorption cycle is dependent only on the temperatures of the absorber, generator, evaporator, and condenser, it is not possible in practice to obtain an arbitrary combination of operating temperatures for these units. If the partial pressure of the absorbent is negligible, the partial pressure of the refrigerant maintained in the absorber determines the operating temperature of the evaporator. This vapor pressure is determined by the pressure-temperature-concentration relations of the absorbent-refrigerant combination. The temperature of the condenser is, likewise, a function of the partial pressure of refrigerant over the solution in the generator. Thus, for fixed operating temperatures and concentrations of the absorbent solution, in the absorber and generator, the temperatures of the evaporator and condenser are fixed. The lithium bromide-water system may be taken as an example to indi-

cate the problems that arise with an arbitrary selection of temperature conditions. If the generator and condenser temperatures are desired to be 230 and 120 deg respectively, the solution in the generator must then have a composition of 67% lithium bromide. However, crystallization occurs in this solution at 160 deg and it cannot be sent through a heat exchanger if the temperature will drop below this point, nor can it be used in an absorber operating below 160 deg. Other absorbent-refrigerant combinations exhibit different phenomena which limit the temperature ranges that can be used in practice. Important considerations which must be taken into account are the solubility, stability, and other properties of the combination which affect thermodynamic properties and coefficient of performance.

The thermodynamic analysis sets forth the various heat quantities encountered throughout the cycle and the effect varying conditions have on them. Consequently, absorbent-refrigerant combination properties affect the coefficient of performance for given operating conditions and determine the merit of a particular combination. There are extreme differences in the heat requirements at various points in the cycle for different combinations.

There are a number of operating variables which affect

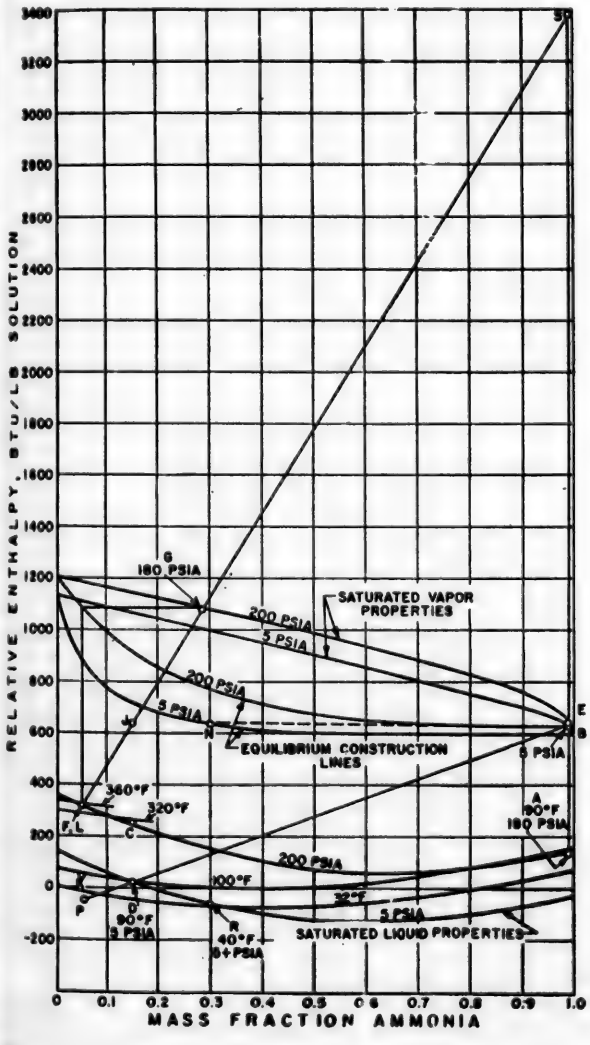


Fig. 4. Solution of absorption system problem on enthalpy-concentration (H-X) chart.

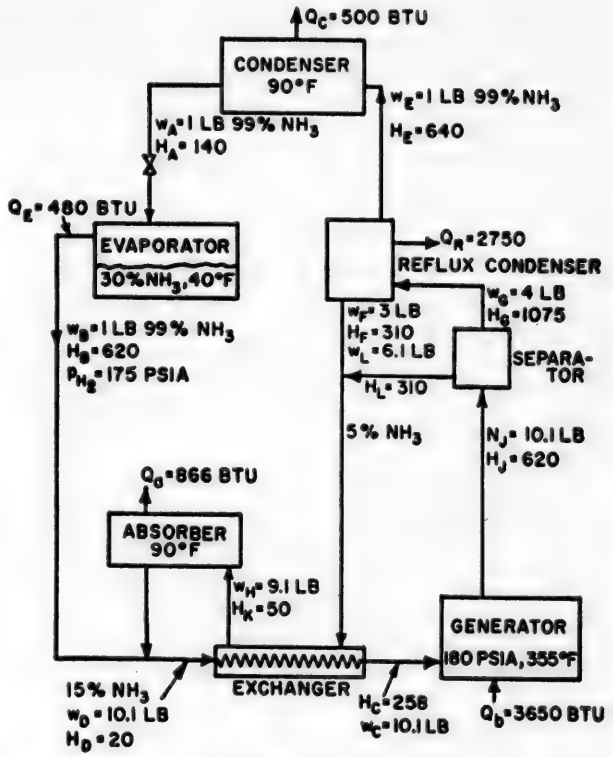


Fig. 5. Summary of solution of ammonia-water absorption cooling system problem.

the selection of an absorbent-refrigerant combination. For example, low fluid circulation rates permit the use of comparatively small system components but necessitate a high latent heat refrigerant, and need absorbent solutions which undergo large concentration changes. Operating temperatures are usually determined by external factors. These temperatures greatly influence the selection of the refrigerant by fixing evaporation and condensation temperatures and consequently pressures. The variables fixed by the refrigerant operating temperatures and pressures determine the absorbent solution operating temperatures. Absorbent solution temperatures are extremely important if salt solutions are used, since they must be such that crystallization will not occur.

The refrigerant should be thermally stable, react reversibly with the absorbent, have a high heat of vaporization, low molecular weight and specific heat. The absorbent should have a high boiling point, low viscosity and low heat capacity. The combination must exhibit high mutual solubility, and exhibit marked negative deviation from Raoult's law.

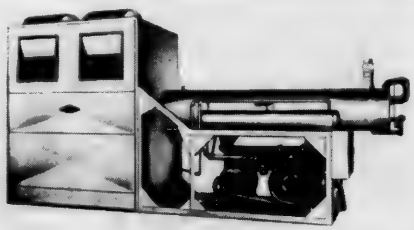
The properties of absorbents and refrigerants have been considered by several authors to determine combinations worthy of trial, and more recently from a thermodynamic approach to determine other types of compounds that should be examined. Careful compilations were made of the available data on the lithium-bromide-water and methylene-chloride-dimethoxy tetraethylene glycol systems as part of the I. G. T. project. Also, a compilation was made of the sources of information on the many other combinations which have been contemplated or tried at various times. A bibliography of some 103 references and 133 patents was also prepared to assist those interested in absorption cooling.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing further information on new equipment and materials described in this department.

Chiller Unit Includes Condenser

Announcement of a line of packaged water chillers, complete with built-in evaporative condensers, is made by Drayer-Hanson, Div. of National-U. S. Radiator Corp., Los Angeles, Calif. Product is designed for industrial and commercial applications, to be matched with individual



room fan-coil-filter air conditioning units as source of central water supply.

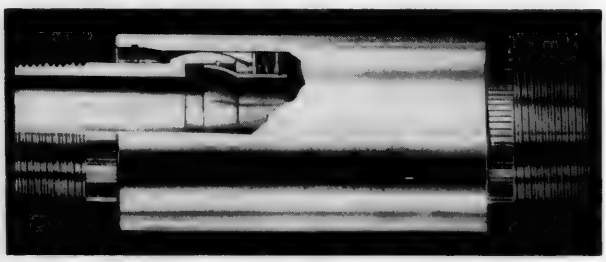
Designated D-H CWG-E, the new line consists of 7½ up to 75-hp packaged water chiller models in eight sizes. Available as standard attachment to chiller is evaporative condenser section. However, it is possible to obtain evaporative condenser separately for field attachment, or shipped separately for remote mounting.

All units are complete with insulated heat exchanger and chiller; insulated suction lines, suction and discharge line vibration absorbers, across-the-line starters, and oil pressure differential switch and thermal expansion valve. Also included are cycling thermostat, freeze-up prevention thermostat, charging valve, condenser relief valve, liquid line strainer and sight glass, condenser water pump, and all controls for trouble-free operation.

More information? Circle Item 1, postcard, last page.

Packless Expansion Joint

A pipe line expansion joint requiring no packing nor highly-stressed metal bellows is sealed by a spring-loaded Teflon wedge. A product of Rotherm Engineering Co., Inc., Chicago, Ill., all pressure-carrying elements are low-stressed steel, and parts in contact with the fluid are chrome plated steel or of other non-corrosive material.

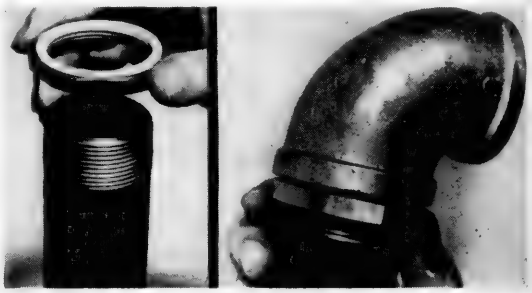


Large amounts of axial traverse are readily available, it is said, normal piping misalignment being accommodated by flexing of the ball inside the wedge. Sizes range from ½ to 6 inches. Maximum operating conditions are 500 psig at 500 deg F. Standard axial traverse is 2 inches.

More information? Circle Item 2, postcard, last page.

Fitting Seals in Refrigerants

A fitting that provides a positive seal against Freon, sulphur dioxide, sulphur trioxide, and most other gases and liquids is introduced by Tru-Seal Div., Flick-Reedy Corp., Melrose Park, Ill. The nut-like fitting withstands burst pressures up to 10,000 psi and temperatures from —200 deg F to +500 deg. It is being utilized by manufacturers of air conditioning and refrigeration equipment, the company states.



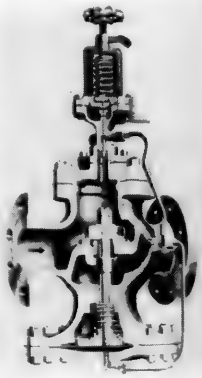
Sealing properties derive from circular Teflon insert. The device is available in pipe sizes from ⅛ to 2½ inches and is applicable for oil, water, air, gas, steam, milk, beverage, vacuum and chemical lines. It is re-usable up to 50 times.

As pictured above right, the device is tightened against the fitting after assembly. Light final tightening is done with a small hand wrench.

More information? Circle Item 3, postcard, last page.

Integral Pilot Regulator

A regulator with integral pilot is announced by Spence Engineering Co., Inc., Walden, N. Y., especially for marine service and other applications in which vibration is a factor. To achieve the stability of pilot mounting required by marine and other severe service, the pilot body is securely attached to the top flange of the regulator.



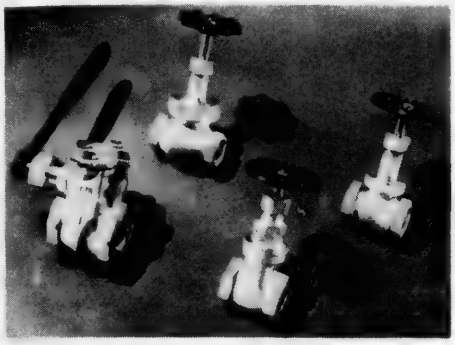
Disassembly for inspection or repair of the pilot is easily accomplished by removing four bolts. The main valve need not be removed from the line.

The pilot is external to the main valve, with external control connections, which makes trouble-shooting easy. Pilot replacement for routine maintenance is quick and easy. The same pilot fits all sizes of regulators.

More information? Circle Item 4, postcard, last page.

Heavy-Duty Bronze Valves

A line of heavy-duty bronze valves for commercial, industrial, and original equipment application is announced by Hammond Brass Works, Hammond, Ind. Included are globe valves up to 300 lb working steam pressure, gate valves up to 200 lb, and swing checks up



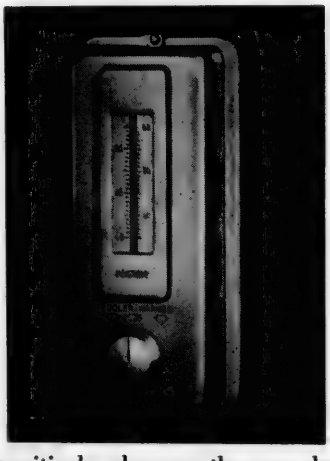
to 150 lb. Each is fully tested, meets government specifications, and is provided with an identification disc, the company states.

Illustrated, left to right: quick-opening gate valve with cam operated solid wedge disc to 125 lb, composition disc globe with union bonnet and slip-on type disc holder to 150 lb, gate valve with solid wedge disc to 150 lb, and brass disc regrinding globe with union bonnet to 300 lb.

More information? Circle Item 5, postcard, last page.

Heating-Cooling Thermostat

Uncomfortable delays in adjusting air-conditioning systems to meet daily and seasonal needs are said to be eliminated by a new positive changeover thermostat announced by Powers Regulator Co., Skokie, Ill. Called Type H-C heating-cooling thermostat, the instrument acts



rapidly and positively whenever the user changes it from heating to cooling, or vice versa. It cannot linger in a "fence-sitting" position, the company said.

The thermostat is used with pneumatically-controlled air-condition systems in offices, schools, hospitals, stores, banks, and other commercial and institutional structures.

For the heating cycle, the instrument operates on a 22-psi supply pressure. For cooling, supply pressure is 15 psi. Whenever the supply pressure is changed, the thermostat's new relay and flapper valve (used instead of a coil spring and bellows) positively changes the control action.

For individual comfort requirements and operating economy in the cooling cycle, a convenient manual screw adjustment provides for as much as a 6 deg F differential between the summer cooling and winter heating control point. On the room type thermostat with exposed adjustment, stops are provided to limit the adjustment range to 3, 6, or 9 deg, often required in hospitals and other institutions.

Temperature range of the thermostat is 60-85 deg with a factory adjusted set point of 75 deg. Temperature response is ½ deg. Maximum recommended ambient temperature is 110 deg. Sensitivity is 2 lb per deg.

More information? Circle Item 6, postcard, last page.

Waffle-Surfaced Machine Mount

A new version of the company's Elasto-Rib machinery mounting, and vibration and noise control pads is announced by The Korfund Co., Inc., Long Island City, N. Y.

Designated Waffle-Grip, this mounting offers a high efficiency, low cost, non-slip cushion for mounting machinery without bolting, plus excellent vibration and noise control characteristics. The pad consists of a layer of resilient cork permanently bonded between two layers of oil-resistant Neoprene which has been embossed in a unique waffle-type pattern. It is made in two types: Standard capacity for loads to 60 psi, and high capacity for loads to 120 psi.

The cross-rib construction increases pad deflection and offers all-directional resistance to machine movement. It also provides an unbroken perimeter which prevents dirt and machine cuttings from accumulating beneath the pad.

More information? Circle Item 7, postcard, last page.

Vitreous China Drinking Fountain

A vitreous china drinking fountain, the Brittany, is announced by Eljer Division of The Murray Corporation of America, Pittsburgh, Pa. The model is modern and functional in design and blends well with today's architectural trends.

Automatic volume control and a non-squirting bubbler as well as a self-closing stop and regulating valve are features of the drinking fountain. Dimensions are 14⅛-inches wide, 13-inches deep, with 10 full inches of wall contact for rigidity. It is available in white or seven pastel colors.

More information? Circle Item 8, postcard, last page.

Duct Is Its Own Insulation

G-B Duct, a round, glass fiber air duct for residential heating and air-conditioning use, manufactured by Gustin-Bacon Mfg. Co., Kansas City, Mo., combines thermal and acoustical insulation with air handling capacity for low-cost installation.

Duct may be used as a complete duct system in conventional duct, extended plenum, attic, or crawl-space installations; as run-outs from metallic extended plenums,

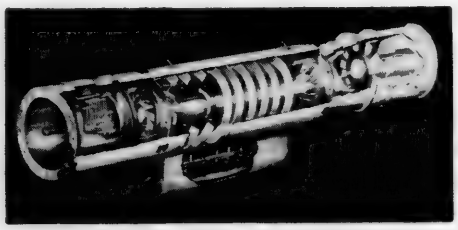
and as sound absorbers in existing systems. A 6-ft section, inserted in a run-out, the company states, is said to provide highly efficient acoustical treatment of existing metallic duct systems, where no acoustical duct lining treatment has been utilized.

Supplied in 6-ft sections, duct is light, tough, semi-rigid, and can be cut with a knife. K factor is 0.21 at 50 deg mean. Manufactured in standard sheet metal ID sizes: 4, 5, 6, 7, 8, 9, 10, 12, and 14 inches, its friction factor is, for all practical purposes in residential work, the same as metal duct, the company states. Packaged sets are available for 2 and 3-ton attic installations.

More information? Circle Item 9, postcard, last page.

Wet-Type Dust Collector

Industry was offered a new tool for dust collecting chores when Joy Manufacturing Company, Pittsburgh, Pa., introduced a dust collector described as one-tenth to one-twentieth the size of comparable equipment. Called



the Microdyne dust collector, the unit is a wet, inertial type which company officials say has an efficiency greater than any comparable wet type collector. They cited test figures which show that the device has an efficiency of over 99% in collecting dust particles of five microns or greater.

The Microdyne is a cylindrical device having two essential parts; a mixer section and an eliminator section. The dust-laden air or gas enters the unit at its mixer section. Here the impingement takes place. Each dust particle is enveloped in water as its passes through a fine spray.

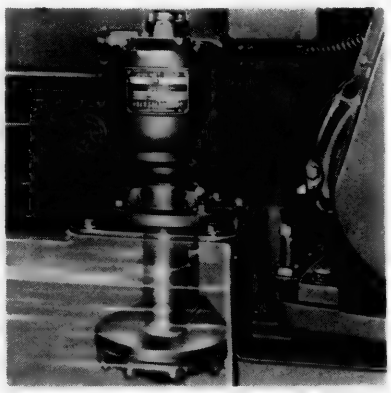
Air and entrained water-enveloped dust pass through turning vanes as they enter the eliminator section. These vanes impart a helical motion which causes a centrifugal force. This force dynamically separates the entrained particles from the air. The dust-laden water is captured at the periphery of the eliminator section in blind louvres which are connected to a disposal sump at the bottom of the unit. The cleaned air passes out of the eliminator section through straightening vanes which recover energy of rotation thus reducing over-all draft loss. If sufficient pressure to drive the gasses is not available ahead of the collector, a vaneaxial fan may be attached at the rear of the unit.

The dust collector can be mounted in existing duct work at the point of use. Space and installation economies to be realized because of this, the company states, are considerable. Applications for the unit, whose capacities range from 1500 to 48,000 cfm, exist in mine and mill ventilation, power plant dust collection, and industrial and commercial air conditioning.

More information? Circle Item 10, postcard, last page.

Circulating and Coolant Pumps

Ingersoll-Rand Co., Phillipsburg, N. J., offers a line of circulating and coolant pumps for sidewall or immersion mounting. They have no stuffing boxes, no pump bearings and no couplings. Their long shaft construction permits high liquid levels. Vent holes provided high in the supporting head protect the motor should the liquid



level in the column rise to excessive heights. The balanced impeller is mounted directly on an oversize motor shaft and thus eliminates the need for a coupling. The rigidness of the shaft eliminates the need for bearings. These features, the company claims, have reduced maintenance to a negligible amount.

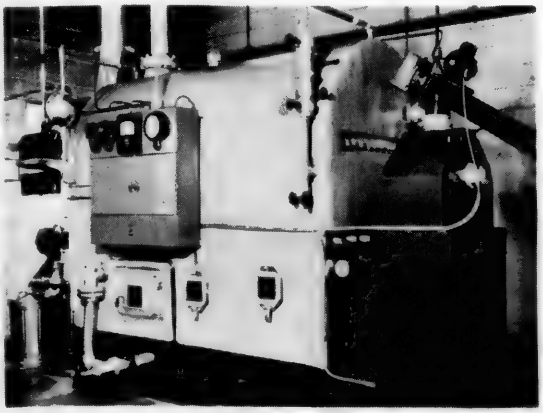
Sidewall mounted units are built in ¾, 1 and 1½-inch sizes with single discharge; also ¾ and 1¼-inch dual discharge units. Horsepower range is ¼ to 5 with deliveries to 180 gpm at heads to 90 ft.

The immersion types, illustrated, are built in ¾ to 3-inch discharge sizes with a horsepower range from ¼ to 10 and deliveries to 500 gpm at heads to 160 ft.

More information? Circle Item 11, postcard, last page.

Coal-Fired Steam Generator

Production of coal-fired BCR automatic steam generators has commenced at International Boiler Works Co., East Stroudsburg, Pa. Developed by Bituminous Coal Research, Inc., equipment is engineered for unit installation in commercial and small industrial plants. Boilers are suitable for steam or hot water heating, and utilize a water-cooled pulsating grate, a water-tube boiler, and coal-feed and ash-removal automatically controlled by a BCR-patented control system.

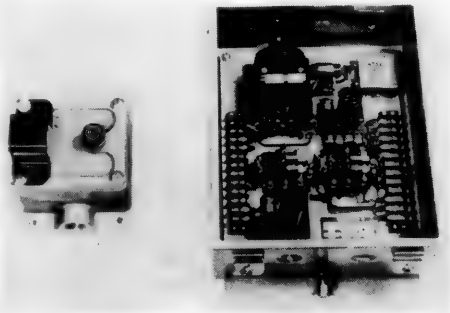


The first four units are now being built for two Columbus, Ohio, area establishments. Units will be manufactured in six sizes, ranging from approximately 2500 to 10,000 lb of steam per hr with pressures up to 160 psi, applicable to space heating, process hot water, and high-pressure steam installations. A substantially smaller unit than conventional stoker-boiler plants with the same output, it is competitive with oil-fired units, BCR states. Combined with economy of coal, the Columbus establishments expect to effect substantial savings.

More information? Circle Item 12, postcard, last page.

Vibration Monitor System

A non-electronic vibration monitor system that is sensitive to increases in vibration yet ignores both starting vibration and transient shocks normal to operation, has been developed by the Fielden Instrument Div., Robertshaw-Fulton Controls Co., Philadelphia, Pa.



The system combines the company's Model 65 malfunction detector, for mounting on the protected equipment, and new Model 651 a-c control unit which is wired to the detector through ¾-inch conduit. Malfunction detector is designed for use in Class I, Group D; and Class II, Groups F and G locations. The control unit is oil-tight and is installed in a non-hazardous location unless connected with an air line using an optional air purge fitting.

Applications include the protection of pumps, motors, blowers, compressors, centrifuges, engines, turbines, and other costly equipment. The control unit is available for operation with 115, 230, or 460-volt a-c control circuits. Models are also available for use in d-c circuits.

More information? Circle Item 13, postcard, last page.

Beams Built into Tower

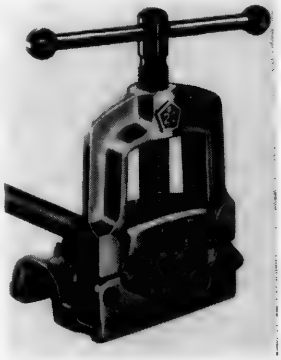
Cooling towers with built-in cross beams, are made by Havens Cooling Towers Div., Havens Structural Steel Co., Kansas City, Mo. Called Verti Flow towers (80-200 ton), their built-in beams are heavy-duty 3-inch channels

(4.0 lb per ft) which eliminate the need for any additional supports except concrete or steel beams running the length of the towers on the outside edges. Not only does this reduce labor and material costs of installation, but tower can be easily moved to another location without creating a major construction problem.

More information? Circle Item 14, postcard, last page.

Pipe Vise Built Sturdily

A pipe and conduit vise designed for hard use and featuring a number of design improvements, is announced by The Toledo Pipe Threading Machine Co., Toledo, Ohio.



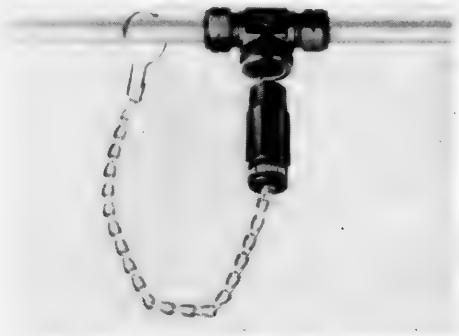
No. 22 vise is built with a strong, sturdy frame and large diameter acme screw thread connected directly to the upper jaw for longer service. The vise yoke mounts quickly for right or left hand use. Hardened steel, interchangeable jaws are designed for maximum grip regardless of pipe or conduit size. A large bolting area assures secure attachment of vise to bench and the contact points are evenly distributed. Non-slip pipe benders prevent accidents because the pipe can not slip out.

More information? Circle Item 15, postcard, last page.

Pipe Plug Warns of Danger

Addition of Danger Signal Bull Plug to its Swagelok line is announced by Crawford Fitting Co., Cleveland, Ohio.

Free hanging with their brilliant red bands, plugs quickly pin point the locations of dangerous openings in piping lines. They cannot get lost, misplaced or carried



away from the job since each plug incorporates a permanently attached chain and ring at the unthreaded end. The ring may be used to circle the valve or piping, or the chain may be spot welded to the line.

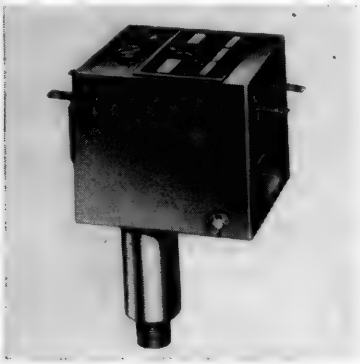
A safe, positive, and convenient method of gaining access to a threaded port of piping or a valve, plug is easy to remove and replace because its long shank provides a good grip, hence the hex is not ruined when the plug is inserted or removed. A long thread is provided to meet installation conditions normally encountered.

Item is available in steel and stainless steel in a range of sizes from ¼ to 2 inch pipe.

More information? Circle Item 16, postcard, last page.

Dual Switch Pressure Control

The development of a dual switch pressure control, the J75A, has been announced by United Electric Controls Co., Watertown, Mass. Like all the company's dual switch controls, the J75A contains two completely separate switches that operate independently of each other for controlling two independent circuits.



Seven models are offered in a variety of adjustable ranges between 0 and 250 psi limits, and maximum pressures up to 350 psi. On-off switch differentials between the limits of 5 to 10 psi, dependent on model, are obtainable.

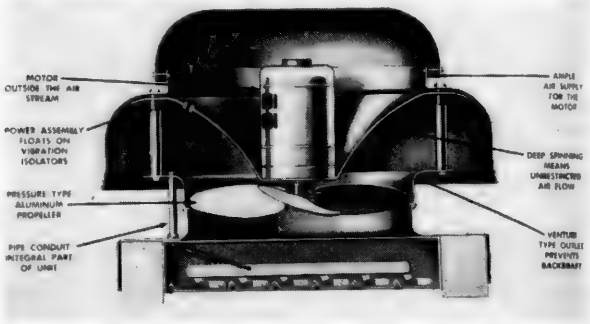
Pressure settings are individually made by independent adjustment screws located on top of the switch bracket. Switches may be set together to simulate double-pole circuitry or set apart to obtain independent operation. Wider limits of differential between switches are available.

The switch is available in any one of three standard types: normally open, normally closed, or double throw with no neutral position. Switches are rated for 15 amp at 115 or 230 volt a-c. Bellows material is either brass or monel. Mounting is via a ⅛-inch male NPT pressure connection.

More information? Circle Item 17, postcard, last page.

Aluminum Propeller Ventilator

A new all-aluminum propeller ventilator has been added to the line of centrifugal roof and wall exhausters produced by Loren Cook Co., Berea, Ohio. Extremely


MOTOR OUTSIDE THE AIR STREAM
POWER ASSEMBLY FLOATS ON VIBRATION ISOLATORS
PRESSURE TYPE ALUMINUM PROPELLER
PIPE CONDUIT INTEGRAL PART OF UNIT
AMPLE AIR SUPPLY FOR THE MOTOR
DEEP SPINNING MEANS UNRESTRICTED AIR FLOW
VENTURI TYPE OUTLET PREVENTS BACKDRAFT

lightweight, the Type FD roof ventilator features an aluminum propeller and spun aluminum construction of all other parts except the motor.

The model is a direct drive ventilator with a pressure type propeller. It is made in four sizes from 680 to 4,040 cfm. Two-speed and explosion proof design are available. The power assembly rests on rubber vibration isolators, as illustrated.

More information? Circle Item 18, postcard, last page.

Smoke Candle Has Long Fuse

Smoke candles for yellow or white smoke in 1, 2, and 3-minute sizes for detecting leaks and checking circulation in air ducts are introduced by Schiller Mfg. Co., Detroit, Mich. They boast long fuses, so that one can light the candle and walk away leisurely and safely.

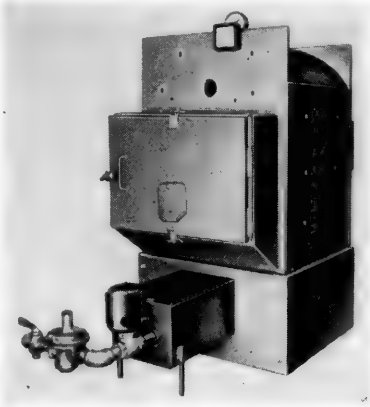
Smoke stains that wash away easily are left, enabling plenty of time to examine the results of the test. Candles may be dropped without danger, cannot break, or ignite unless deliberately lighted, and are claimed by the manufacturer to be non-toxic in large areas.

More information? Circle Item 19, postcard, last page.

Gas Heating Steel Boilers

A series of gas heating steel boilers for natural, manufactured, and mixed gases, known as the HGU Commodore, is built by Portmar Boiler Co., Brooklyn, N. Y., to meet the heating and hot water supply requirements of small and large residential buildings and commercial installations.

ASME-code constructed and stamped, boilers have a double-pass fire travel through many heavy-gage staggered boiler tubes. It is claimed that effective heat transfer and heating efficiency is achieved by the scrubbing action of the rapidly rising water in multiple passageways between the boiler tubes; and also by the separation of the hot gases distributed into many single streams. Low draft resistance is created due to the staggered tube design, permitting operation with low-height chimneys. All tubes are accessible for servicing and cleaning.

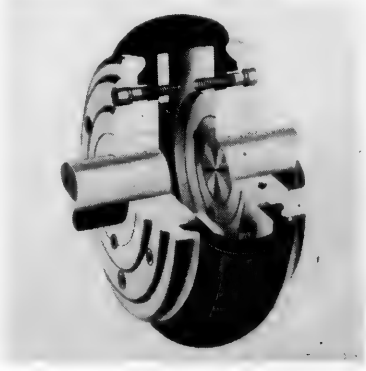


Gas burner is of the multi-tube inshot type and is fully automatic, constructed of stainless steel and copper. Series comes in 9 sizes with net steam ratings from 400 to 2,200 sq ft; net water ratings are 720 to 3,960 sq ft.

More information? Circle Item 20, postcard, last page.

Tire-like Flexible Coupling

Para-flex, described as a wholly new conception in flexible couplings, is announced by the Dodge Manufacturing Corp., Mishawaka, Ind., as the latest addition to its line of power transmission machinery.



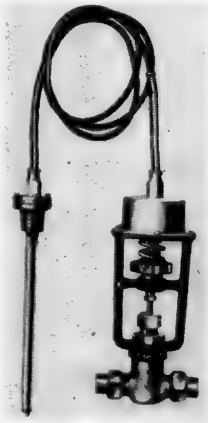
The ability to handle angular misalignment up to 4 degrees, parallel misalignment up to ⅛ inch, and end-float up to 5/16 inch, and any combination of these, is only one of many advantages claimed for the coupling. The flexible member also cushions shock loads and diminishes torsional vibration, thus protecting both the driver and the driven machine in applications up to 600 hp at 900 rpm.

Heart of the flexible coupling is a tire with synthetic tension members bonded together in rubber. The coupling consists of the flexible tire clamped between two hubs which are mounted on the shafts to be coupled. The flexible member is held between the flanges and clamp rings of the hubs. The tire has a transverse split molded into it, which permits easy installation and makes replacement possible without moving driver or driven machine. To make a change it is only necessary to loosen the cap screws enough to allow removal of the tire and to fit a new one in place. Even in very confined spaces this simple operation can be accomplished in a few minutes.

More information? Circle Item 21, postcard, last page.

Line of Temperature Regulators

Watts Regulator Co., Lawrence, Mass., announces a new line of temperature regulators for automatic flow regulation of liquids or steam. These are accurate, self-operating, direct acting, and reverse acting, single seated regulators.



The 155 Series direct-acting regulators, illustrated, maintain liquid temperature by controlling the heating source such as steam. They are available in sizes ½ to 1½ inches inclusive. The 157 Series reverse-acting regulators are used to maintain liquid temperature by controlling the cooling source such as water. These are available in ½ through 1-inch sizes.

Standard 155 and 157 Series are available with a 40 deg F operating temperature range between 100 and 240 deg and feature overheating protection, rugged bronze body construction with replaceable stainless steel seats. They are easily adjusted for temperature control.

More information? Circle Item 22, postcard, last page.

Plastic Construction Material

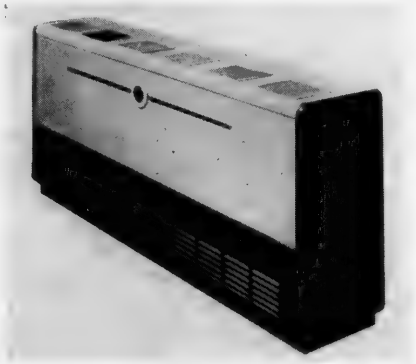
A two-ply type light-weight plastic construction material for severe corrosive fume service has been introduced by Heil Process Equipment Corp., Cleveland, Ohio.

This material, Rigiply, is a fiber glass reinforced laminate of thermosetting resins which is resistant to a much wider range of chemicals, including both acids and alkalies, than has been possible in the past, the company states. A solid combination of two laminates, it can be engineered and fabricated for use in fume exhaust hoods, ducts, stacks, fume scrubbers, and tank covers for pickling, plating, and chemical plant operations up to temperatures of 250 deg. F.

More information? Circle Item 23, postcard, last page.

Electric Unit Ventilator

An electric unit ventilator especially designed for school classrooms is introduced by American Air Filter Co., Inc., Louisville, Ky. The Herman Nelson Electric Unit uses an electric heating coil and combines all the advantages of company's Draftstop system of classroom cooling, heating and ventilating, with the installation advantages of electric heating.

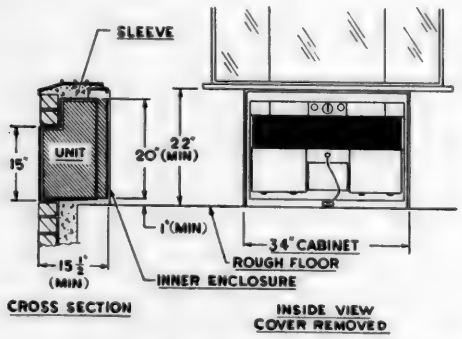


Unit has been tested extensively in varying climates on the West Coast, the company states, and has been found to consume from 1.3 kwh to 30.0 kwh, depending on the heat load required to keep the classroom comfortable.

More information? Circle Item 24, postcard, last page.

Built-in-Wall Conditioners

Built-in-wall air-conditioners, known as In-Wall, and designed to blend with any type of convector heating units in a single plane, is developed by I. W. Air Conditioning Corp., New York, N. Y., Div. of I. Wenig & Sons, Inc. The self-contained conditioners can be used with equal effectiveness in apartment houses, hotels, and motels as well as in private homes and office buildings, the company states.



Control panel provides quick choice of cooling, dehumidification, ventilation, exhaust, fresh air intake and filtration. Each unit has a built-in thermostat calibrated in degrees, and all components are over-sized, for extra ruggedness and durability. Exterior louvered grilles and trim are of aluminum and can be sized to match any brick, marble or metal coursing.

Four oversized centrifugal blower fans move a large volume of air at low velocity over the cold coil instead of one or two fans moving a smaller amount of air at a rapid rate. Available in ¾, 1 and 1½-ton sizes, units provide enough filtered fresh air intake to permit windows to remain fully closed against outside dirt and noise. A separate exhaust motor and fan will eliminate stale room odors.

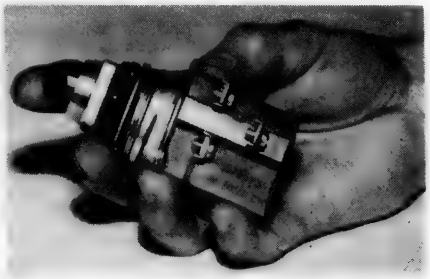
Interior covers, involving one, two, or three contiguous matching enclosures, depending upon under-window area to be treated, extend from the rough floor up to the window sill stool, eliminating small areas of plaster that often peel off or crack. Enclosures are also available for both the air-conditioner and convector to form the sill for the window.

More information? Circle Item 25, postcard, last page.

Push-To-Test Indicating Light

A push-to-test indicating light unit that provides a quick and positive method of testing for burned out lamp bulbs on control panels and push button stations, is announced by General Purpose Control Dept., General Electric Co., Schenectady, N. Y.

Through the use of a continuously energized testing circuit an immediate indication of a faulty bulb is given by pressing the unit's color cap. It is not necessary to remove the indicating light cap or the bulb.



The device's basic unit is interchangeable with the company's illuminated oiltight push button by simple removal of jumper wiring. Field tested for long, dependable life, the unit's heavy-duty contact block is the same as on other oiltight units. Easily fitted in the same hole and mounting space as existing oiltight units, the push-to-test device can be panel- or back-mounted.

More information? Circle Item 26, postcard, last page.

Long Slot Diffuser

Universal Diffuser Corp., Tuckahoe, N. Y., announces a new type of long slot diffuser sold under the tradename of Line-Air. This slot diffuser has the advantage of being able to direct the air into the room at approximately 90 deg to the face of the diffuser. It can be placed directly onto the duct in very long continuous strips without requiring equalizing deflector blades. The air leaving the diffuser is broken up into counter-current jets, thus preventing stratification.

The slot diffuser is suited to supply a warm air barrier on large window spaces, and can be supplied in long lengths of varying widths.

More information? Circle Item 27, postcard, last page.

PVC Screwed Pipe Union

A plastic 3-inch screwed pipe union is introduced by Walworth Company, New York, N.Y. The large union, made of highly corrosion-resistant rigid polyvinyl chloride, increases PVC piping application possibilities which have been limited by the availability of only smaller sized unions. These PVC piping systems

are used to handle corrosive fluids in food and chemical processing industries, the refining industry, and in the paper and marine fields.

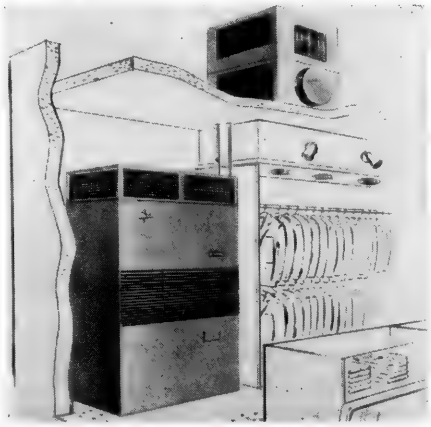
Surfaces in the joints of the three-part union are designed to provide a tight seal against flow leakage. The PVC material is exceptionally resistant to most salts, alkalis, and acids at temperatures as high as 150 deg F, and it is equally resistant to corrosive elements in factory atmospheres and operations.

Weighing about 1½ lb the 3-inch union is easily handled and installed. A knurled ring provides a better grip. The union is available with threaded or solvent-weld socket-type ends in high- or normal-impact PVC.

More information? Circle Item 28, postcard, last page.

Waterless Units to 30 Tons

Development of two remote air-cooled condensers enables Airtemp Div., Chrysler Corp., Dayton, Ohio, to offer waterless commercial packaged air conditioners in sizes up to 30 tons. Condenser Models 7005 and 7005-1 operate in conjunction with company's standard packaged units.



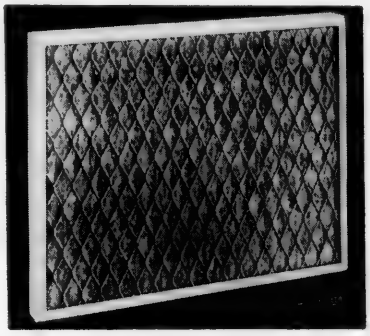
A control system permits condenser operation at any temperature between 0 and 120 deg F outside air. When package unit starts and head pressure builds up to a predetermined point, pressure switch starts all condenser (two or more depending on the size of the package) fan motors. When ambient air temperature drops to 60 deg, one of 7005-1 fan motors will be cut off. In the case of a 15-ton job, the second 7005-1 fan will shut off when ambient drops to 50 deg. This would leave only the 7005 condenser operating below 50 deg. For operation below 50 deg, installation of an automatic damper motor is mandatory. Damper and motor will control air volume to hold a constant head pressure.

More information? Circle Item 29, postcard, last page.

Aluminum Industrial Filter

A-Lum-O-Aire permanent dry-type aluminum-wool media filters are offered by Carey Electronic Engineering Co., Springfield, Ohio.

For all domestic, commercial and industrial air-cleaning requirements, unit catches and holds dust, dirt and



lint particles, without the use of oils or adhesives. Millions of minute barbs do all the filtering.

Rustproof, fireproof, and highly resistant to chemicals or adverse atmospheric conditions, filters are easily rejuvenated for continuous service by cleaning with a vacuum or flushing with water. The result is a significant decrease in maintenance and replacement costs, the company states.

Available in standard or specially-engineered sizes, and thicknesses of ½, 1 and 2 inches.

More information? Circle Item 30, postcard, last page.

Announce Line of Plastic Pipe

Super Pi-Mar, a line of plastic pipe for commercial and residential plumbing applications, is introduced by Pyramid Industries, Inc., Erie, Pa. The pipe is fabricated from high density and conventional polyethylenes produced by Chemical Div., Koppers Company, Inc.

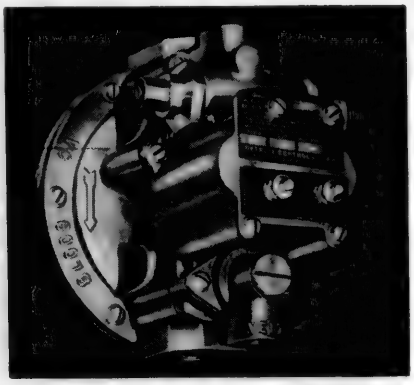
According to the manufacturer, Super Pi-Mar takes advantage of the optimum tensile strength characteristics of these new plastics. As a result, pipe series meeting the specifications for working pressures at 75, 100, and 125 psi can be produced with minimum wall thickness and an equivalent saving in weight over conventional tubing.

Stronger than conventional polyethylene tubing, pipe is coilable, can be securely joined at all unions with special clamps, and carries the National Sanitation Foundation Testing Laboratory Seal of Approval.

More information? Circle Item 31, postcard, last page.

Combination Gas Valve

Model V-600 combination gas valve, designed and built by Detroit Controls Corp., Detroit, Mich., incorporates a gas valve, pressure regulator, and safety pilot in a compact, integrated unit.



A large-capacity unit capable of handling up to 300,000 Btu per hr, it provides for safe lighting and fully safe pilot shut-off with all gases. It is recommended for central heating applications.

More information? Circle Item 32, postcard, last page.

Disposable Refrigerant Cylinder

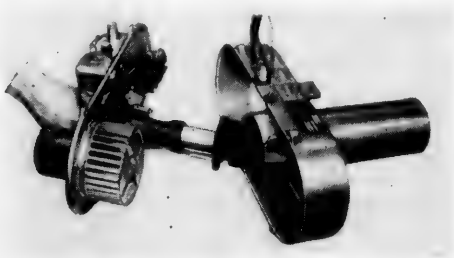
A 132 cu in. disposable cylinder for handling refrigerants and other aerosols and compressed gases has been added to the line of 55 and 75 cu in. industrial size disposable containers manufactured by Tube Manifold Corp., North Tonawanda, N. Y.

These cylinders measure 4 inches in diameter and 12 inches in length, and have convenient 5 lb capacity. Stocking, delivery and use in the field are simplified. Likewise, distributors' refunds and return transportation costs are eliminated.

More information? Circle Item 33, postcard, last page.

Power Inshot Gas Burner

Nu-Way Corporation, Rock Island, Ill., has announced a new power inshot gas burner. Designated as model G200 and having an input range of 80,000 to 200,000 Btu per hour, the gas burner is AGA-approved.



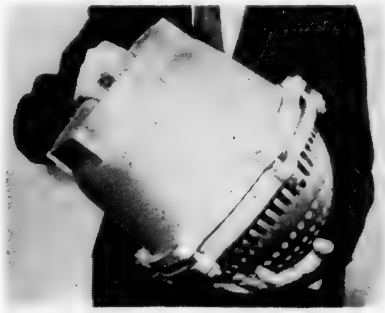
All operating parts and complete factory wiring are assembled on one mounting panel as illustrated. This facilitates removal to a work bench as well as protection from heat. The orifice is easily accessible. A manifold cap is removed and the orifice can then be unscrewed, while gas supply lines remain untouched. Thus the input rate can be varied throughout the range by changing orifices—a job that takes only a minute or two.

Installation of the burner itself is also rapid, according to the company. The unit uses the existing conbustion chamber on oil burner replacements; no internal furnace changes are normally necessary. The burner is also AGA-approved for target wall installation.

More information? Circle Item 34, postcard, last page.

Aluminum Foot Valve

A heavy-duty aluminum foot valve with strainer, so light that it can be handled easily by one man, has been developed for use in irrigation, construction, mine drainage, general industrial, and inland marine pumping applications. Designed by Clayton Mark & Company, Evanston, Ill., manufacturer of well and pump supplies,



the new foot valve weighs only 41 lb for the 8-inch pipe size, less than half is much as the traditional iron valve. The 6-inch pipe size valve weighs only 19 lb.

Rugged construction is a feature of the valve. Developed and tested in the company's research laboratories, it has proved to be resistant to corrosion and mechanical damage. The top and basket of the valve are constructed of heavy-walled aluminum alloy castings and the body is carefully threaded and machined for easy assembly to the pipe. Also made of aluminum is the valve seat ring which is replaceable. The valve flap is made of canvas-reinforced rubber that fits snugly to the seating surface.

More information? Circle Item 35, postcard, last page.

Adds Solenoid Valve to Line

Type 20 is added to its line of solenoid valves by The Sporlan Valve Co., St. Louis, Mo. This model has a nominal rating of 5 tons (Refrigerant-12) providing an intermediate valve for the capacity range between those of Types 12 and 73.

With a maximum opening pressure differential (MOPD) of 275 psi, valve can be used for both Refrigerants-12 and 22, and has a 5/16-inch orifice, with 5/8-inch ODF connections on inlet and outlet.

It is powered by company's coil in all standard voltages including dual voltage up to and including 115 volts.

Bulletin 30-30A contains all details.

More information? Circle Item 36, postcard, last page.

Air-Cooled Commercial Unit

An air-cooled packaged air conditioning unit for commercial applications known as the SAC, specifically designed to work solely as an air-cooled unit, has been announced by Worthington Corporation, Harrison, N. J. Available in 3, 5, and 7½-hp sizes, the unit is equipped with a hermetic air-cooled compressor that eliminates the need for conversion; an air-cooled weather-proofed condenser with high capacity blower and motor; lifetime lubicated bearings on the fan and fan motor; and an automatic switch for correct temperature control.

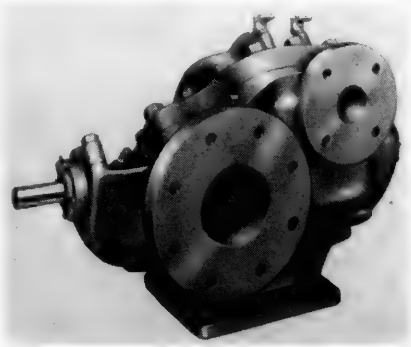
Units are internally wired at the factory and are available to operate on 208, 220, 440 or 550 volt a-c. Optional accessories include discharge plenum with adjustable grille louvers; hot water or steam, or non-freeze steam 2-row heating coils; and spray type humidifier.

More information? Circle Item 37, postcard, last page.

Diagonally Split Case Pumps

Aurora Pump Div., The New York Air Brake Co., Aurora, Ill., has developed a line of diagonally split case centrifugal pumps, Type AJ, suited to many applications, important among which is boiler feed service as well as hot or volatile liquids applications requiring low NPSH characteristics.

These pumps, while retaining the advantages of the horizontally split case pumps embody advantages inherent in the 45 deg casing split. The features, in common with horizontally split case pumps, are ability to remove the entire rotating element without disturbing the piping or the pump-motor-base alignment. The 45-deg split allows both suction and discharge to be in the bottom half of the casing but above the center line of the pump.

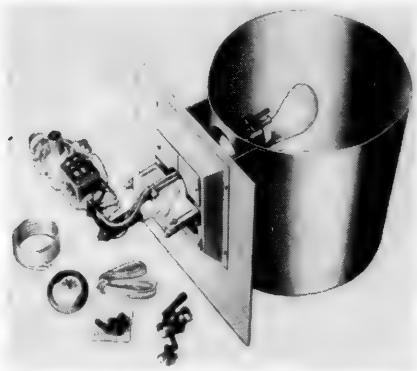


Pumps are self-venting and will not vapor lock. Thus the need for bleeding back to the feed water heater or the receiver is eliminated. Large suction areas give ideal NPSH characteristics. Available in water cooled stuffing box and water cooled bearing construction when required, pumps have as standard, No. 125 A.S.A. suction flange and No. 250 A.S.A. discharge flange, and are usually bronze-fitted but can be furnished all-iron or stainless steel trim for high temperature conditions.

More information? Circle Item 38, postcard, last page.

Oil-to-Gas Conversion Unit

A new oil-to-gas conversion unit has been developed by the Banner Burner Co., Youngstown, Ohio. The unit is the OG-56, and the manufacturer lists as advantages its ease of installation (the unit fits through a four-inch oil burner sleeve), and one-piece cast iron construction of the venturi and flame spreader.

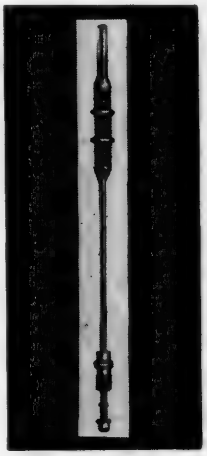


The unit is assembled for easy installation with only three parts: front plate, one piece venturi and flame spreader, and manifold. Inputs range from 60,000 to 150,000 Btu per hr input. The burner has been tested and certified by the AGA.

More information? Circle Item 39, postcard, last page.

Higher Voltage Thermocouple

Its Super-Clad thermocouple, which generates greater electrical output than standard thermocouples, has been developed by Grayson Controls Div., Robertshaw-Fulton Controls Co., Long Beach, Calif.



Thermocouple is interchangeable on all standard pilots, the company announces, and is designed to eliminate service calls caused by needless pilot outages. It is said to insure positive, trouble-free, holding action.

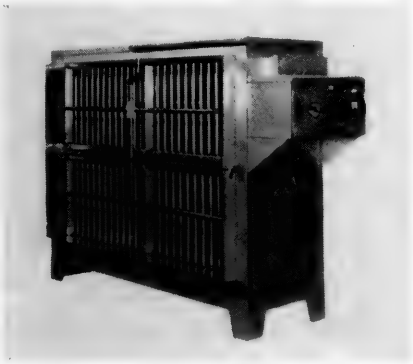
Improved thermo-electric alloys are used to gain increased voltage output. Plating, called Super-clad, protects the copper from heat and prevents oxidation, resulting in more positive operation, it is explained.

Twenty-four cooling fins create a greater temperature differential for increased efficiency; tin plating on the contact end results in better electrical operation.

More information? Circle Item 40, postcard, last page.

Electronic Air Cleaners

Three models have been added to the Compact line of electronic air cleaners made by Electro-air Cleaner Co., Inc., Pittsburgh, Pa. Two of the new units have greater air cleaning capacity than any of the nine models formerly comprising the line. The third new unit augments existing models in the high side of this product category.



All three models were introduced, says the manufacturer, to make possible more accurate sizing plus more efficient and economical installation of electronic air cleaners in medium-sized stores or plants.

The models are: 132-H which has a capacity to clean 3200 to 4000 cfm; No. 160-H that can clean 6000 to 7200 cfm; and No. 180-H which has a 8000 to 9600 cfm capacity. Model 132-H is sized for installation with heating equipment having 320,000 to 400,000 Btu per hr input and with 7½ ton capacity cooling equipment. The 160-H and 180-H are for installation with 600,000 to 960,000 Btu per hr input heating equipment, and with 15 to 20 ton capacity cooling units.

More information? Circle Item 41, postcard, last page.

Device Measures Skin Depth

A new quality control instrument for measuring as little as one ten-thousandth of an inch of paint film, electroplating or metal overlay has been developed by General Motors Research Staff, Technical Center, Detroit, Mich. The device, the Laminagage, is a non-destructive tester that can be used for a high rate of production testing. Already in service in two GM divisions, it is portable and can be plugged into any 110-volt outlet in a plant. No special training is needed to operate it.

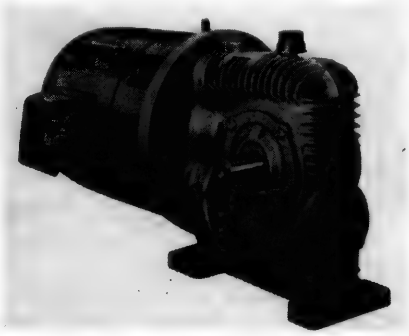
The instrument consists of a small metal cabinet containing electronic equipment and a probing coil connected by coaxial cable with the cabinet. The probing coil is used to contact the part under test and it can be designed for probing parts of virtually any shape—curved, flat, angular or rod-like. On front of the cabinet is a large dial. When the probing coil contacts the part under test, the thickness of the paint film or plating overlay on the part instantly registers on the dial. If the dial needle ranges between certain calibrated points, the part is up to standard. Otherwise, the operator knows the part is sub-standard or a reject.

The device utilizes the principle that the distribution of an alternating electric current in an electrically conducting material is greatest at the surface and decreases as it penetrates beneath the surface. The rate at which the current decreases beneath the surface depends on how readily a substance can be magnetized, how readily it conducts electricity and the frequency of the alternating electric current. For example, when an alternating current of a single frequency penetrates a layer of copper over steel, it experiences a change in magnitude depending on the layer thickness. However, the Laminagage sweeps through a fixed range of frequencies and locates the frequency at which the magnitude of the current reaches a fixed value. The frequency thus determined is related to the thickness of the copper layer.

More information? Circle Item 42, postcard, last page.

Right-Angle Gearmotor

A new line of space-saving right-angle gearmotors with heavy load-carrying and shock-absorbing qualities for industrial applications has been introduced by Reliance Electric and Engineering Co., Cleveland, Ohio.



The gearmotors, in one to 10-hp sizes for continuous-duty applications, and one to 30 hp for intermittent duty, are now available with such features as horizontal or vertical mountings, conventional double shaft, and hollow shaft, to fit all types of applications calling for reduced speeds.

Gearmotors can be supplied with either an a-c or d-c motor of any speed or duty rating, and any standard type of enclosure: protected-open, totally-enclosed, or explosion-proof. The footless motor, with D-flange and modified shaft, is bolted directly to a flange that is cast integrally with the gear housing.

More information? Circle Item 43, postcard, last page.

Hot Water Controls

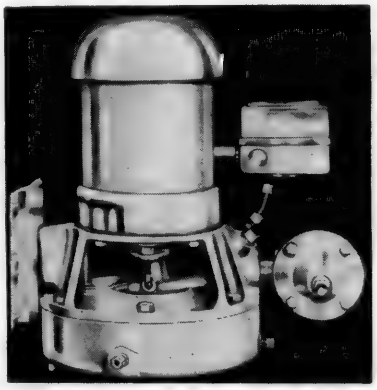
For the manufacturer who sells packaged boilers with controls pre-wired, the White-Rodgers Co., St. Louis, Mo., offers its 840 line of combination hot water controls, for use on either oil or gas-fired systems.

Included are circulator-relay and temperature controls in various combinations, such as relay with high limit or low limit-circulator controls; and relay with triple action control, which combines all three. They are designed for use with low voltage anticipated room thermostats, and with either line or low voltage primary controls.

More information? Circle Item 44, postcard, last page.

Centrifugal Pumps, Educers

Redesign of its line of Burks HV-Centrifugal pumps is announced by Decatur Pump Co., Decatur, Ill. Increased production efficiencies, the company states, has resulted in a substantial price reduction. Units are finished in white.



Educers for shallow well use with ¾ and 1-hp models afford capacities to 1840 gph at 5-ft lift and 20 psi. Performances to depths of 200 ft are published. Educers are introduced and ratings published for application of these pumps on 2-inch diameter wells to depths of 140 ft.

Its mechanical seal, it is said, is not harmed if the pump runs while dry.

More information? Circle Item 45, postcard, last page.

Broad Line of Unit Heaters

Its Sunnyaire line of unit heaters for commercial and industrial applications is announced by Crane Co., Chicago, Ill. Units are available for gas firing, hot water, and steam.

Type H, in 24 sizes, is a horizontal unit with a coil of continuous U-bend design that gives equivalent performance on hot water or steam. Rear connections make installations flush with the ceiling convenient. Type HV,

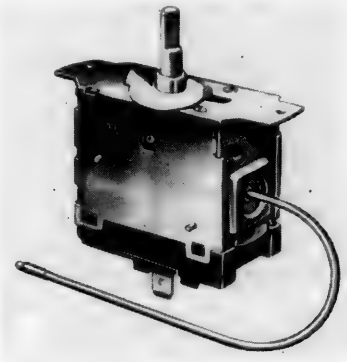
in 34 sizes, has rectangular, wrap-around heating element of seamless copper tubing and corrugated aluminum fins. In either horizontal or vertical position and with 6 types of discharge outlets, it can be mounted for a variety of air discharge patterns.

Gas-fired heaters (see illustration) are available in 7 sizes, have aluminized steel heat exchangers for corrosion resistance, and warm up in 18 seconds. They are automatic, have permanently lubricated fan motors, and a hinged bottom door for quick access to burner and pilot.

More information? Circle Item 46, postcard, last page.

New Air Conditioning Control

A versatile air conditioning control that operates fan and compressor with a single dial knob is introduced by Ranco Inc., Columbus, Ohio. The F17 control is particularly will suited for window air conditioning equipment where compactness and versatility of function are essential, the company states.



The unit features two switches in a single stainless steel case for operation of both a one-speed fan and a compressor with a common control knob. Rotating the knob from *off* position first switches on the fan, while secondary positions operate the compressor.

Control permits a dial range of up to 25 deg and features a minimum 4-deg differential using a vapor-pressure element, or a 4½-deg minimum differential with a cross-ambient element. Both switches of the F17 are single pole, single throw. A dummy terminal for two connections may be added to the insulator.

More information? Circle Item 47, postcard, last page.

1-Hp, 7½-Amp Room Conditioner

Announced by Fedders-Quigan Corp., Maspeth, N. Y., is a one-horsepower, 7½-amp room air conditioner for 115-volt service. Rated at 9000 Btu per hr under ARI Standard 110-56, the unit, Model 712S, is claimed to deliver more Btu per watt than any other room unit available.

Now, where existing electrical service is inadequate or where loaded-to-the-limit wiring cannot supply the 12-amp current required for standard 1-hp units, this low current unit is applicable for plug-in service through even a clock radio. Room conditioner features a 2-cylinder hermetic compressor, oversize evaporator, three-row condenser, and high power factor of 99.3%.

More information? Circle Item 48, postcard, last page.

Utility Truck Bodies

New utility truck bodies specially designed for air-conditioning and refrigeration contractors and service firms are announced by Reading Body Works, Inc., Reading, Pa.

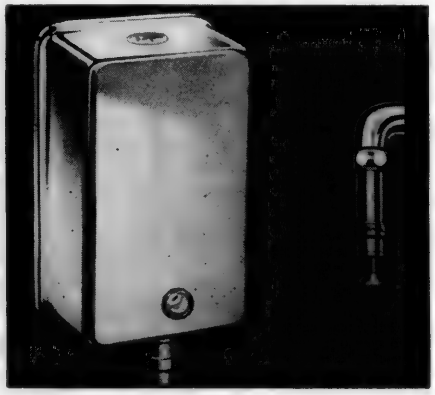
Developed through cooperation with refrigeration and air-conditioning contractors, these new bodies are especially adapted to the transportation and field utilization of pipe and tubing, hand and power tools, conduit, switch panels, ladders, pipe fittings, and small parts and tools of all types.

Available models include utility and panel bodies with canopy tops, in chassis sizes from ½ to 1½ tons. All bodies are constructed of heavy gage steel welded into one integral unit, with completely watertight doors, reinforced tailboards, and complete undercoating. Variable compartment and shelving arrangements provide large storage and load areas.

More information? Circle Item 49, postcard, last page.

Liquid Soap Shower Valve

Model No. 863 vertical shower valve for liquid soap is made without projections which can cause injury in case of accidental fall or slip, announces its manufacturer, Bobrick Dispensers, Inc., Brooklyn, N. Y.



Valve projects only 1¼ inches from the wall. Overall height of valve is 4½ inches. Designed for use in any soap system, valve has Neoprene O-ring packings and operates under pressures to 100 psi.

For multiple shower installations, an easy-fill low level supply tank is available (as illustrated). For showers having one or two shower heads, another dispenser is provided.

More information? Circle Item 50, postcard, last page.

Plastic Pack for Cooling Towers

A new series of Flow-Mizer cooling towers incorporating a new-type, light-weight plastic pack is introduced by Acme Industries, Inc., Jackson, Mich.

Reduced weight and increased efficiency assure cooling tower users of top performance for air conditioning and industrial liquid cooling applications. Capacities of the new models range from 20 through 200 tons.

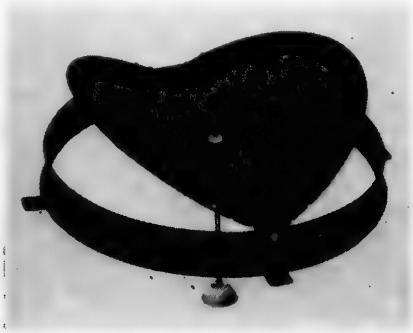
Corrosion and rust are things of the past with the tough, chemically inert plastic used in the cooling towers. Cleaning is made simple; the light-weight sheets are held in file drawer mountings which are easy to slide out and remove from the tower for inspection and cleaning. The pack saves up to 90% of the weight of steel packs. A steel pack in a 100-ton cooling tower normally would weight up to 2300 lb; the company's plastic pack weighs 180 lb.

More information? Circle Item 51, postcard, last page.

New Diffuser Dampering Method

A new push-pull concept of dampering both round and square ceiling diffusers is announced by Air Control Products, Inc., Coopersville, Mich.

Model 78 round damper fits all company round diffusers in sizes of 6, 8, 10, 12, and 14 inches. Model 91



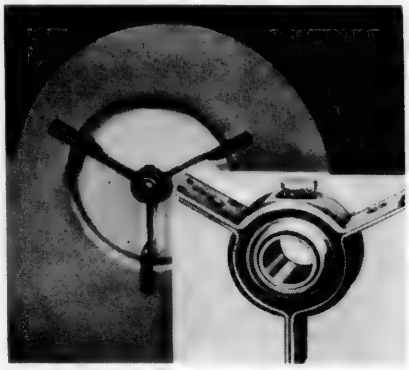
square damper fits the company's square diffusers in 6, 8, 10, 12, 14, and 18-inch squares. Replacing dangling chains, the dampers are rod-operated, with a plastic operator knob which may be removed, if desired, to prevent tampering with any setting.

A nylon friction bearing allows smooth, silent operation when changing the volume from any setting, and holds the butterfly type valves in any selected position.

More information? Circle Item 52, postcard, last page.

Bearing Unit in 3-Arm Mounting

Designed and constructed by the manufacturer, Triangle Manufacturing Co., Oshkosh, Wis., with a completely new and improved Tri-Arm mounting is the pressed steel Hiawatha ball unit bearing. Features of this mounting are its triple cantilever-beam action which unites and pyramids the separate strengths of housing and bracket, and the new multi-ribbed cushion engineered to perform several services simultaneously.



The company states that careful structural design has formed less than eight ounces of steel into a rigid bracket that enables manufacturers' blower units to withstand the severest drop-handling encountered in freight shipping. The multiple pads of the 50 durometer Neoprene liner appreciably increase resiliency over solid cushions; provide ventilation over the bearing; and being under slight pressure on the ball surface, develop a tire-like grip on it to prevent any rotation. Combined with these actions it is a double-end floating wedge to retain the ball within the formed socket. A simple action either inserts or removes the ball unit, without interference from assembled oil cup.

More information? Circle Item 53, postcard, last page.

Water-Cooled Room Units

Introduction of a new line of water-cooled room air conditioners is announced by Remington Corp., Auburn, N.Y. The line consists of three models, called water-cooled Consolaires as follows: Model 10A62—1 hp (12 amp) for 115 volts, and Model 10A43—1 hp deluxe for

230 volts, both rated at 11,300 Btu per hr; and Model 15A43—1½ hp deluxe for 230 volts, rated at 16,600 Btu per hr.

Conversion packages are available to adapt the 230-volt models for 208 or 250-volt service. The dimensions of all models are alike: 36 inches high by 30 inches wide by 13 inches deep. Three cabinet inclosures are offered: imported mahogany in traditional finish, mahogany in blonde finish, and furniture steel in chestnut brown baked enamel.

According to the company, the market for water-cooled room air conditioners, used either singly or in multiple, may be divided into three parts: (1) interior spaces for which air-cooled units are impracticable; (2) locations in the tropics where the climate is too severe for air-cooled units; and (3) at the seashore where air-cooled units quickly "rust out". Special models are available for shipboard use.

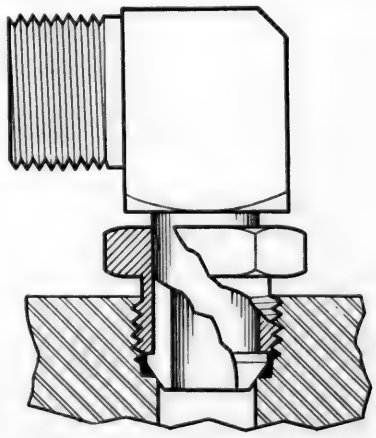
Water consumption for the 1-hp and 1½-hp sizes is given at 70 and 100 gph. For multiple installations, a central water-cooling tower is recommended.

More information? Circle Item 54, postcard, last page.

Straight-Thread Fitting

Of interest to hydraulic equipment manufacturers and users is a newly designed, straight-thread fitting with metal-to-metal seal, available from Flodar Corporation, Cleveland, Ohio, whose construction permits a positive, leakproof seal through metal-to-metal contact.

A primary advantage of this fitting is the space saving affected in multiple setups where several hydraulic lines



must be concentrated as in control panels, valves, pumps, cylinders, manifolds and special machinery. It makes possible the setting of high pressure hydraulic fittings side-by-side on subpanels. For example, the user can put two ½-inch fittings side-by-side with one inch or less center-to-center spacing, using straights, ells, and tees.

Second, despite its extreme compactness, complete flexibility in attaching and removing the fitting is achieved with ordinary tools, regardless of shape or style, since no swing radius is required.

The metal-to-metal seal fitting is available in sizes from ¼ to 2-inch OD and in all conventional shapes. The company makes the unit in self-flaring, no-flare, and flare-type fittings.

More information? Circle Item 55, postcard, last page.

Multi-unit Type Conditioner

Model 3T-FF multi-unit type water-cooled air conditioner, manufactured by Airflex Corp., Champaign, Ill., is designed for residences, commercial, and industrial buildings. Tamper proof and factory sealed, it may be equipped by the manufacturer with a two-row hot water or steam heating coil. Company's Water Saver cooling tower, matched to the unit, is also available.

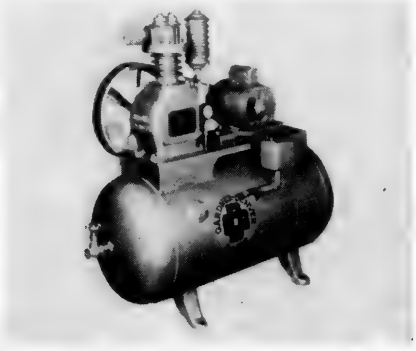
Capacity data is as follows: 39,515 Btu per hr of cooling at 85-deg entering air, 85-deg water; based on 1200 cfm of 60-deg entering air, heating is 67,000 Btu with 6 gpm of 200-deg water, 92,800 Btu with 2-lb steam.

Fan and filter section, temperature control is included. Unit may be suspended from ceiling as a complete system, can be installed with duct connections to inlet and/or outlets, and may be used in multiples for step or zone control. Its use (without heating coils) is recommended for applications where cooling is required but where methods of heating other than those that use furnace fans are employed.

More information? Circle Item 56, postcard, last page.

Pneumatic-Controls Compressor

Available from Gardner-Denver Co., Quincy, Ill., is a small compressor that supplies oil-free air. The new unit is Model CACB, designed to provide oil-free air for the operation of instrument controls, as well as for use in manufacturing processes.

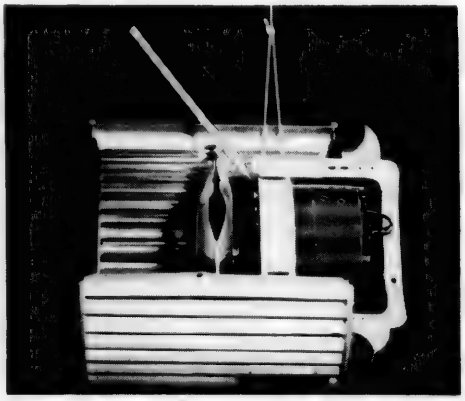


The heart of this space-saving compressor is said to be in the carbon parts in the cylinder which require no oil or water lubrication. The model is a single-stage, air-cooled unit which is available base or tank mounted. It supplies 4 to 5 cubic feet of air per minute, and is suitable for discharge pressures of 40 to 100 psi. Automatic start and stop controls are supplied as needed.

More information? Circle Item 57, postcard, last page.

Balanced Blowers

Development of a blower motor and wheel mounting for its new interchangeable Series B direct-drive blowers is announced by Viking Air Products, Cleveland, Ohio.



With floating support, the motor and wheel are held at their center of balance. Mounting is a 3-arm motor support holding a motor band (at pencil tip in illustration) which circles the motor at the center of gravity of the motor-wheel combination. Neoprene vibro cushions mounted on this band flex against vibrations, absorb motor noise, and conduct static electricity through the blower.

Blowers are dimensionally interchangeable with competing models.

More information? Circle Item 58, postcard, last page.

Remote Humidity Indicator

Model HGS-RHY-A2 remote humidity indicator, designed for measuring humidity of closed areas, is available from Serdex, Inc., Boston, Mass. Unit has wide application in the laboratory, for research, and in plant operations.

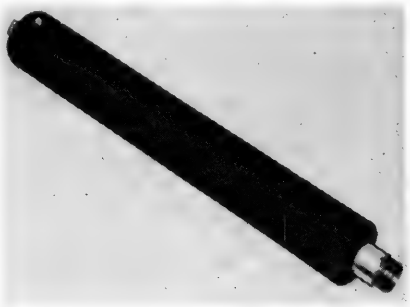
Indicator can be located in office, laboratory, or control room away from the area to be measured. An air line is run into the area to be sampled. A vacuum pump or line draws sampled air through the indicator.

To install the instrument, two connections, one from the inlet at the bottom of the indicator case to the air line from the container or area sampled, the other from an outlet at the top of the case to a vacuum pump or line, are made. No wiring is needed, since operation is mechanical. No conversion charts are necessary. For production use, the indicator can be installed permanently to give continuous humidity readings. Its price is one hundred and seventy-five dollars.

More information? Circle Item 59, postcard, last page.

Deep Well Filter

Model D Flo-Clear filter made by Filtros Inc., East Rochester, N. Y., is shaped to fit down inside cased wells, for use with deep well pumps. Standard 1¼-inch pipe fitting in the end attaches to end of supply line in well. A plug at the bottom can be removed so that one or more



extra filters can be fastened on end-to-end for greater capacity and less frequent cleaning. Its 3½-inch dia permits use inside a cased well of 4-inch dia.

Filter will trap and filter out all suspended foreign matter such as sand, grit, gravel, insects, and other substances which might otherwise damage the pump's precision working parts. Cleaning is accomplished by reversing the direction of flow of water through the filter.

More information? Circle Item 60, postcard, last page.

Smokeless Industrial Incinerator

An industrial incinerator for smokeless disposal of combustible liquid waste materials is available from Prenco Products, Inc., Hazel Park, Mich. Designated the Model SF-1 smoke-free industrial incinerator, the unit is specifically designed to handle liquid paint sludges, thinners, oils, solvents and any other combustible wastes that can be rendered to a liquid or slurry form. It is adaptable to any viscosity range between air-setting waxy compounds and gasoline.

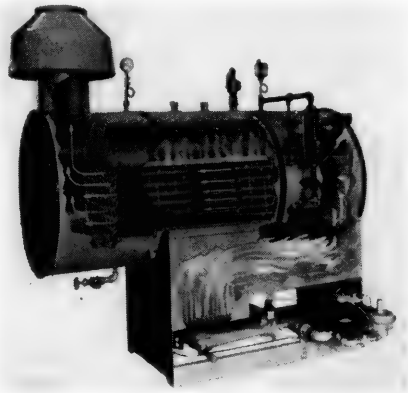
The incinerator provides full combustion at temperatures in excess of 3000 deg F with no ash in either the retort chamber or effluvia. The high operating temperature contributes to rapid burning rate and high efficiency. Installed cost is reported to be 75 to 80% lower than that of conventional incinerator types.

Complete installation consists of the retort mounted on its base, a waste storage tank and a flush-out tank, together with a suitable pumping circuit, pipe, valves and electrical controls. The combined overall height of base and retort is approximately 10 ft. Outside retort diameter is 30 inches. Total weight is approximately 4500 lb, including refractory. The incinerator is rated at 1,900,000 Btu per hr.

More information? Circle Item 61, postcard, last page.

Portable HRT Boiler

A portable HRT boiler is available from P. M. Lattner Manufacturing Co., Cedar Rapids, Iowa. Design features of the boiler include a built-in combustion chamber and



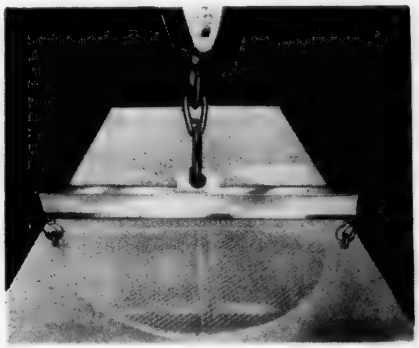
use of atmospheric gas burners. Operation is silent; no forced draft is required, merely a vent.

The boilers are available for 100 and 125 psi pressures in sizes from 3 to 50 hp. Boilers are well suited for operation of process steam equipment.

More information? Circle Item 62, postcard, last page.

Simplify Tower Installation

A detachable hoisting yoke which simplifies the shipping and installation of cooling towers is introduced by Havens Cooling Towers Div., Havens Structural Steel Co., Kansas City, Mo.



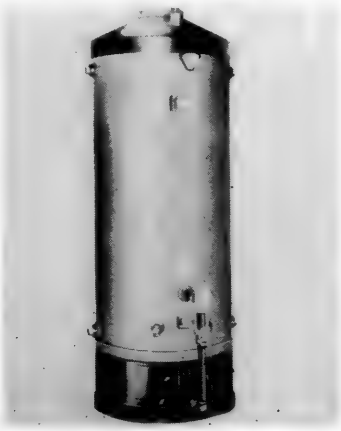
The yoke, which is furnished with each tower (80-200 ton), is easily hooked onto eyebolts in the top of the tower making installation faster and simpler. The yoke is quickly detached after the tower is in permanent position.

More information? Circle Item 63, postcard, last page.

Upright Water Boiler

For laundries, motels, small hotels, cafes and various industrial shops, Ewing Mfg. Co., Oklahoma City, Okla., offers an upright, automatic, gas-operated hot water boiler.

No storage tanks are needed. The smallest model, which will raise 250 gal 60 deg each hour, occupies less



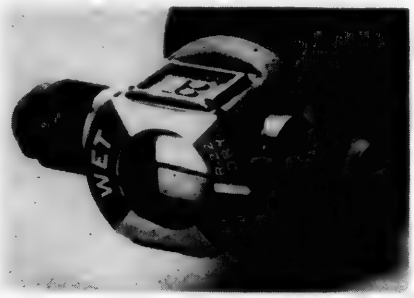
than two feet square of floor. The second size will raise 432 gal 60 deg and is 25 inches in diameter. The largest model will raise 720 gal 60 deg, is 31 inches in diameter, and 82 inches tall. Storage capacities range from 55 to 145 gallons. Water can be safely heated as high as 200 deg F.

Shipping weights on the three models are 600, 850, and 1325 lb. Safety pilot control-thermostat is AGA-approved and shuts off gas in case of pilot failure. Thermometers show temperature of the water at all times. All models are equipped with magnesium rods. Inside surfaces are sandblasted, then coat with a special zinc preparation and baked at 500 deg.

More information? Circle Item 64, postcard, last page.

Moisture Indicating Sight Glass

A combination moisture indicator and sight glass, the Super Dry-Eye, is introduced by Ansul Chemical Co., Marinette, Wis. The new servicing instrument has been designed to enable refrigeration service engineers or equipment owners to detect basic refrigeration system



trouble in its earliest stages and prevent costly breakdowns. The device is a T-shaped brass fitting, similar in size, general appearance and price to the company's regular Dry-Eye. However, where the regular device offered only one moisture indicating element, the new instrument has two, one for Freon-12 and another for Freon-22, plus a built-in sight glass.

Moisture indicating element for Freon-12 shows blue in color when the refrigerant is dry and in safe operating condition, below 10 ppm. When this element turns pink the refrigerant is dangerously wet, above 30 ppm. For Freon-22, the indicating element is green when dry (below 20 ppm); and pink when wet (above 25 ppm).

The circular fused glass window through which the moisture indicating elements are visible also serves as a sight glass. Bubbles in the flowing refrigerant indicate a low refrigerant charge or a restriction in the line.

More information? Circle Item 65, postcard, last page.

Foot Valve Guide and Guard

A device designed to speed installations of jet water systems, and to protect foot valves, jets and plastic pipe from damage during installation, has been developed by Joseph A. Brenner, Hanover, Pa. Known as the Brenner Guide & Guard, the product is made durable cast aluminum in two half sections, and includes designs for all sizes of wells and all types and makes of foot valves.

It is assembled around the foot valve and clamped onto the foot valve body by tightening 3 cadmium-plated machine screws. Its spearhead design prevents catching or digging into the sides of the well as the jet assembly is lowered down the casing, thus eliminating any need to use force, and assuring good condition of the foot valve, jet and plastic pipe at the bottom of the well.

With the use of the new device, complete jet installations have been made in a matter of a few minutes regardless of depth of well or stiffness of the plastic pipe due to outside temperature.

More information? Circle Item 66, postcard, last page.

Valves for —300-Deg Service

Stainless steel gate and globe valves, in sizes from ½ to 12 inches, for handling liquid oxygen and other extremely low temperature liquids is available from Valve and Fitting Div., Cooper Alloy Corp., Hillside, N. J.

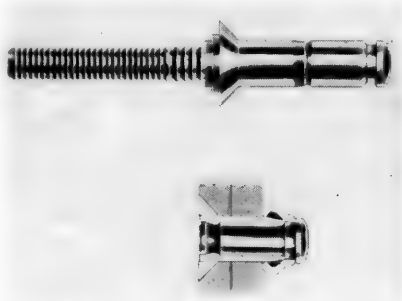
Valves operate at around —300 deg F and at pressures of 150 - 600 psi, and are designed with extended bonnets to permit the use of heavy insulation between the operating mechanism and the pipe line which serves to prevent heat pick-up into the valve and its contents and to allow free movement of the operating mechanism.

More information? Circle Item 67, postcard, last page.

Positive-Lock Fastener

A rivet-type fastener of hardened alloy steel for blind application is available from Huck Manufacturing Co., Detroit, Mich.

Designated the Tau Bolt fastener, the new device is ¼ inch in diameter. It is available in a wide variety of grip lengths with either counter-sunk of brazier head. Positive mechanical lock, high shear strength and high tensile pre-load are among the outstanding features.



Pins break flush with the collar when the fastener is driven, and shank dimensions are held to unusually close tolerances to permit interference fit fastening designs. It is a four-piece design, consisting of pin, expansion sleeve, filler sleeve and locking collar. Illustration shows action of device. At top is fastener prior to installation. At bottom is section through the installed fastener. Note how collar swages into locking ring to provide positive mechanical lock.

More information? Circle Item 68, postcard, last page.

Cleans Duct, Furnace, Filter

Its Turbo-Vac line of vacuum cleaners and the recently developed Drum-Seal are incorporated by The Kent Co., Inc., Rome, N. Y., into a contractors' "cleaning team" for boiler and furnace cleaning, removing dirt from ducts and piping, cleaning filters, and cleaning up after installations or repairs.

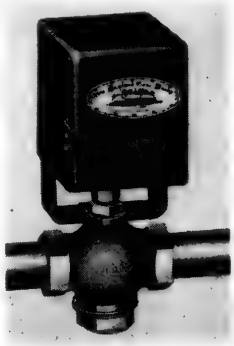
Cleaner alone may be used either as a complete unit for ordinary light cleaning operations. The head only and Drum-Seal may be used as a team. These two components, placed on an ordinary metal drum or container, permit the contractor to perform heavy-duty cleaning operations with a minimum of fuss. Container may be set on a dolly for easy maneuverability.

Cleaners come in four models, with tank capacities from ⅔ bushel (5 gal) to 1⅔ bushels (10 gal).

More information? Circle Item 69, postcard, last page.

Motor-Operated Globe Valve

A motor-operated globe valve is available from New England Gear Works, Southington, Conn. Obtainable in ten sizes of Jenkins Bros. bronze globe bodies, ¼ to 3 inches, the valve is exceptionally small and permits great flexibility in installation. Unit permits choice of three operating voltages, 24, 115, and 230 volts, and three timing cycles, 8, 32, and 139 seconds.



In spite of low cost, the unit features automatic disc compensation, tight shutoff, no mounting restrictions, permanent lubrication, and quiet, positive operation. The service free operator, utilizing machine cut, hardened steel gears and a continuous duty, shaded pole motor, is specifically designed for heavy duty industrial and heating applications.

This unit can be controlled by any positive action single-pole double-throw switch such as temperature, float, manual, time, or pressure-actuated controls.

More information? Circle Item 70, postcard, last page.

Self-Equalizing Expansion Joints

A line of improved corrugated self-equalizing expansion joints for power and process piping systems is available from Zallea Brothers, Wilmington, Del.

In protecting piping and related equipment against damage due to temperature change, these expansion joints employ equalizing rings to distribute pipe line expansion equally to all of the corrugations. This prevents over-compression of the corrugations beyond their design limit. The equalizing rings also support the roots of the corrugations against internal pressure. This permits the use of thinner metal in the bellows, giving the self equalizing expansion joints lower flexing stresses and thus longer operating life.

These expansion joints feature four major improvements over previous models. They are: (1) 100% longer life, (2) 30% length reduction, (3) 30% less weight, and (4) greater stability at high pressures because of the reduction in ratio of length to diameter.

More information? Circle Item 71, postcard, last page.

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Proximity of Cooling Tower to Smoke Stack Causes Corrosion, Disrupts System

PROBLEM: Two cooling towers, sitting in the sun; corrosion struck, and then there was one. This variation on the old rhyme was literally the case for Schick, Inc., Lancaster, Pa., where two air conditioning systems, one a compressor-type 150-ton installation serving office space, and the other an absorption refrigeration 510-ton unit serving manufacturing area, have separate cooling towers. Shortly after the 510-ton unit went into operation, serious operating difficulties developed which virtually shut down the air conditioning equipment. Examination showed strong corrosive conditions as revealed by iron and copper deposits in the condenser, and water analysis taken from the plant cooling tower. Surprisingly, however, water samples from the office cooling tower, only 150 ft away, showed only scale-forming conditions which were expected due to hardness of Lancaster water.

SOLUTION: Water Service Laboratories, Inc., New York, N. Y., who conducted the water analyses, reported that

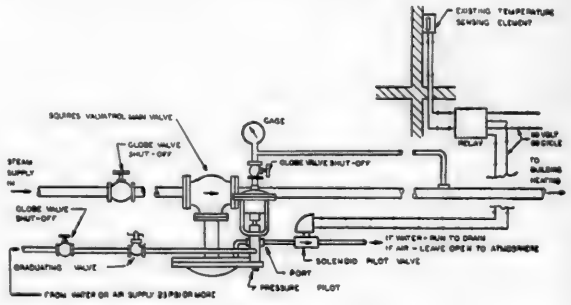
the larger cooling tower was located close to and downwind from a smoke stack, and that discharge from the stack, containing carbon dioxide and sulfur dioxide, entering the tower was causing the water to become extremely corrosive. The smaller or office cooling tower, not being affected by the stack, was subject only to the formation of scale due to composition of the city water. Under the direction of Schick's maintenance foreman, the height of the smoke stack was increased by 15 ft so that it would discharge above the nearby tower. In addition, based on the analysis of the deposits found, regular water treatment service was started by the Laboratories' Philadelphia branch using the company's proportioning feed device, Chemistat, at the circulating pump.

RESULTS: After the necessary corrective measures were taken, the air conditioning equipment operated normally and without incident for the remainder of the season. When the cooling equipment was opened for inspection at the end of the season, it was found to be in excellent condition.

Building's Heating System, with Controls Added, Supplies More Space with Less Steam

PROBLEM: In spite of liberal use of purchased steam, tenants on the top floor of the 4-story Engine Parts Mfg. Company building in Cleveland, Ohio, were cold. The brick structure has 7260 sq ft of steam radiator surface and houses light manufacturing and commercial businesses.

SOLUTION: Pressure-reducing valves and a heat control system were installed, including a day-night and weekend shutdown thermostat. Control, adjusted to open in 8



min, shuts in 5 sec, resulting in regulation of temperatures within 1 deg F.

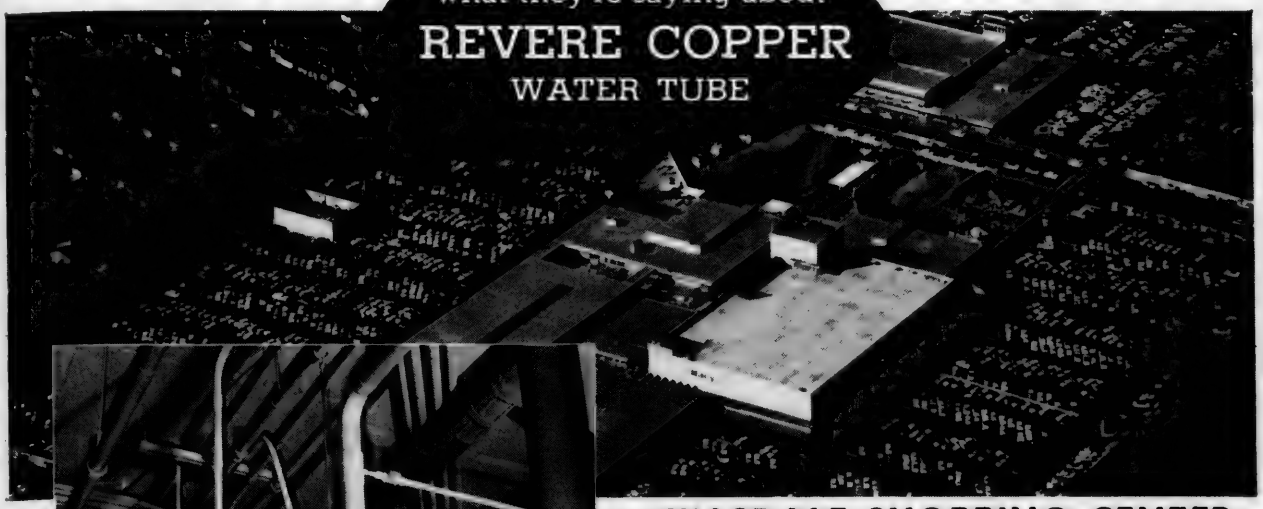
Pressure reduction is achieved in this Valvatrol system, manufactured by The C. E. Squires Co., Cleveland, Ohio, as pilot valve proportions up-stream high pressure steam at correct pressure on main valve diaphragm. When pilot senses main valve is sufficiently open to permit system satisfaction, full pressure closes main valve steam flow, automatically maintaining correct pressure reduction. Variable slow opening occurs in response to thermostat.

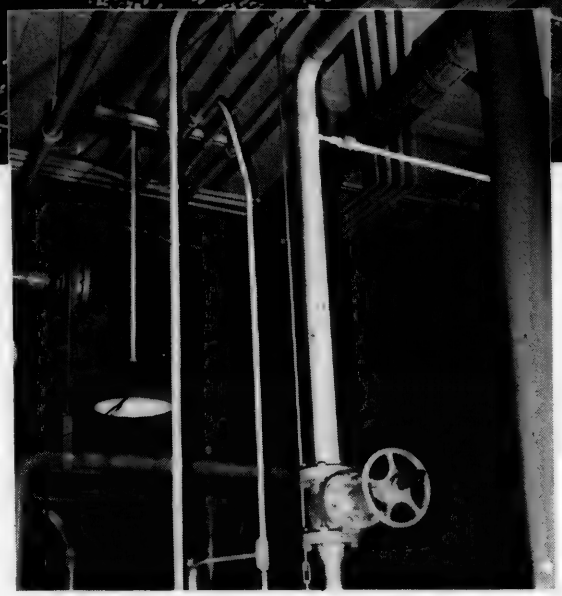
In the majority of installations, dead-end of steam flow is accomplished with full line pressure against main valve diaphragm. In this case, however, initial steam pressure is merely 20 psi, and 60-psi city water is used to activate the pilot. Dead-end force is 60 times 87 (sq in. effective diaphragm area), or over 5000 lb. See diagram.

RESULT: Though top floor tenants now have heat, the building uses 20% less steam, resulting in a saving of nearly 400 dollars in 3 months of operation. This is borne out in records of purchased steam for corresponding periods before and after installation, and calculation and comparison of pounds usage per degree-day.

what they're saying about

REVERE COPPER
WATER TUBE





THIS MAMMOTH CENTER containing over 800,000 sq. ft. of space employs 30,600 ft. of Revere Copper Water Tube from ½" to 4" diameter for its water and refrigeration lines. A section of the installation is shown above. Note neatness and compactness. Tube was furnished by Revere Distributor: TAY-HOLBROOK, INC. Architect: WELTON BECKET & ASSOCIATES. Both of San Francisco.

HILLSDALE SHOPPING CENTER

San Mateo, California

"There just isn't any other material that's as easy to work with or as economical to install"

Says, EDWARD P. HICKEY, Co-owner W. L. Hickey Sons, Inc., San Bruno, Sunnyvale, Sacramento, and San Rafael, Cal.

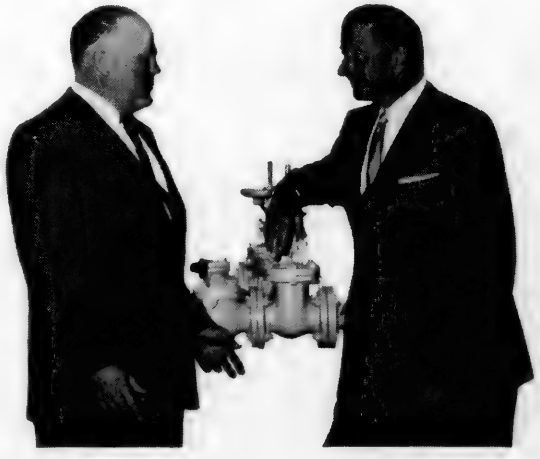
"Why take a chance on a material that can rust when a copper job costs no more"

Says, DAVID D. BOHANNON, President, David D. Bohannon Organization, San Mateo, Cal.

Mr. Bohannon, who has built over 20,000 homes in the San Francisco Bay Area, and is an originator and developer of the "California Method" of mass-production-on-the-job-site building techniques, continued, "In today's 'tight-money' market using copper water tube is more important than ever. For with copper I can give my clients a low-cost job without any sacrifice of quality."

"I've found that copper water tube, because of its solder fittings, and ease of prefabrication and handling, costs less to install than rustable materials," said Mr. Hickey, mechanical contractor.

Builder, contractor, architect, engineer . . . all agree that there is no "or equal" when it comes to copper water tube for hot and cold water lines, radiant panel heating, air conditioning lines, underground service lines, drainage, waste and vent stacks. See your Revere Distributor for your needs.



REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Rome, N.Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N.Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

COPPER ★ BRASS ★ 1801 ★ REVERE ★ ALUMINUM

NEWS OF THE MONTH

CLASSROOMS

in North provided with air conditioning systems that need only chillers for summer operation.

School air conditioning, already established in the southwest, is spreading rapidly in the north and east, educators, architects and engineers were told.

Future economies in school construction and operation are behind the growing trend to provide for "future cooling" in the design of classroom buildings, according to Charles S. Stock, American Air Filter Co., Inc., Louisville, Ky., sponsor of a school air conditioning conference in New York.

• **MORE SUMMER SESSIONS**—Factors contributing to the air conditioned school trend are increasing summer school enrollments in high schools, teachers' colleges and

universities, and increasing use of audio visual equipment, including closed-circuit television, at all school levels, Mr. Stock reported.

Completely air conditioned schools are occupied, or under construction in Schenectady, N. Y., Alton, Ill., Jal, N. M., Phoenix and Tucson, Ariz., Los Angeles, Calif.

Air conditioning systems designed for future addition of chilled water central cooling are occupied, or under construction, in Lodi, Fresno, Lancaster and Bakersfield, Calif., Denver, Colo., Mesa, Ariz., Owensboro, Ky., Gary, Ind., Skokie, Ill., and Dubuque, Iowa.

• **SELF-FINANCING**—One of first northern elementary schools with year-round air conditioning is SS Peter & Paul parish school, Ross Township, Gary, Ind. Equipment for each classroom includes 24-inch TV which utilizes telecasts from Chicago's channel 11 educational station, WTTW, bamboo blinds for daylight control, and HerNelCool air conditioner, as illustrated. Rev. John Beckmann, pastor, credits television and other audio visual aids, as well as year-round air conditioning, for making possible school's high teaching load, from 40 to 60 students per instructor. Designed by architect Harry McComb, Hammond, Ind., and mechanical engineer, Reynolds & Barich, Gary, Ind., for future cooling, the school is installing its chilled water refrigeration this summer. Father Beckmann expects to finance cooling equipment through rentals from air conditioned multi-purpose cafeteria for community affairs.

MINOR FLICKERS

in lighting caused by air conditioning units are tolerated by public, AIEE meeting hears.

Because of public acceptance of minor lighting variations and economic limitations, it is no longer feasible to maintain previously closely regulated voltages for illuminating, it was said in a report on voltage drop caused by air conditioning units, made at the Great Lakes District Meeting, Des Moines, Iowa, American Institute of Electrical Engineers.

Some 20 years ago when electric appliances were com-

(Continued on page 114)

THROUGH-THE-WALL

Compact heating-cooling package illustrated is part of an experimental and demonstration house designed and planned by the National Association of Home Builders Research Institute at Kensington, Md., near Washington. Built by Frigidaire Div., General Motors Corp., Dayton, Ohio, it installs through the wall of the house.

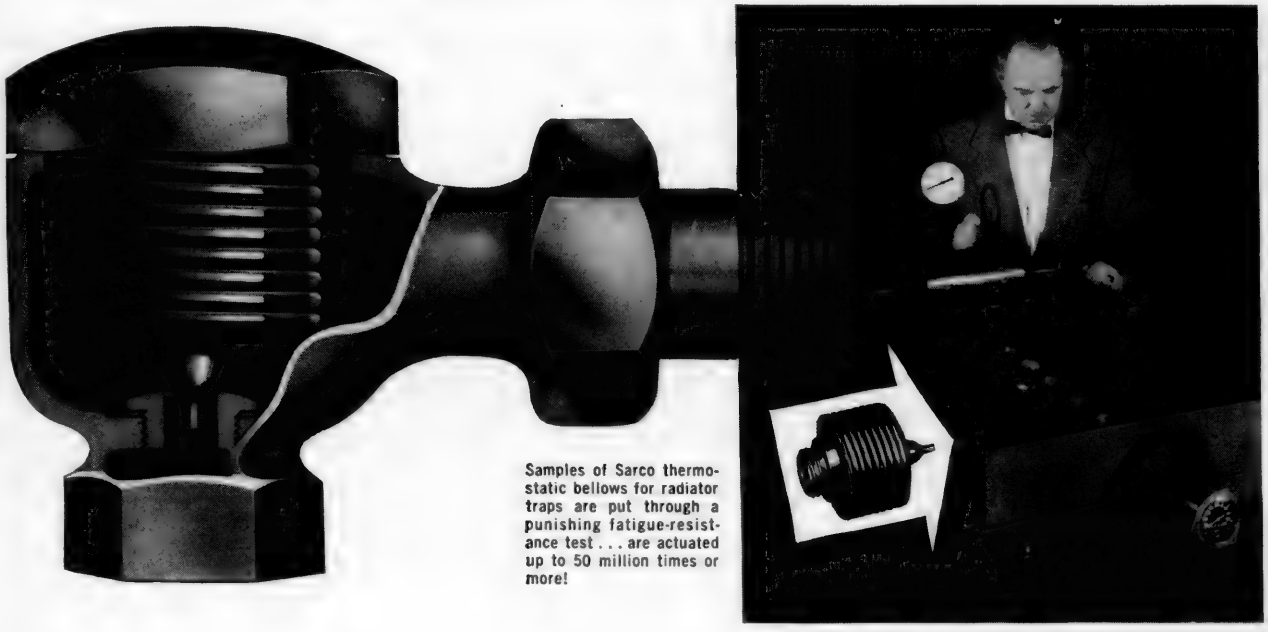
A 2-ton capacity air-cooled condensing unit, and cooling coils, make up the 350-lb factory-assembled package. Condensing unit (1) remains outside the house as cooling coils (2) slide through wall on heavy brackets (large circle) into furnace plenum. Furnace (3) is mounted on plenum.

Vertical down-flow gas furnace has 105,000-Btu input. The heating-cooling system is of the perimeter-radial type.

Operation of the conditioner is accomplished by turning of a knob to either heating, cooling, or off, after which the thermostat takes over. Servicing and maintenance are facilitated by removable panels on the condensing unit outside, and by the fact that the entire condensing unit and coil assembly can be pulled out of the wall from the outside, exposing the parts. The furnace can be serviced from inside the house.

50,000,000 cycles can't be wrong!

How Sarco guarantees "on-the-job" performance of Thermostatic Radiator Traps



Samples of Sarco thermostatic bellows for radiator traps are put through a punishing fatigue-resistance test . . . are actuated up to 50 million times or more!

This is the most gruelling test a thermostatic radiator trap could possibly get. It's a thermostatic bellows test that goes on endlessly . . . day after day, year after year . . . in the Sarco Research Lab.

In this Sarco research and product development work, thermostatic bellows for Sarco radiator traps are expanded and contracted 50,000,000 times or more to test and study their fatigue-resistance!

Further to assure you the utmost on-the-job dependability, production samples of Sarco thermostatic bellows are tested to *10 million cycles* and more!

OTHER IMPORTANT ADVANTAGES

Extra-strong union nut and nipple — made of bar stock, not just brass castings.

Extra-rugged body — insured by *pressure* casting. Eliminates porosity. Maximum insurance against hidden defects.

Every body pressure-tested at maximum rated steam pressure.

Removable seat — for easy replacement. Seat and self-aligning valve head made of hard bronze.

ASK FOR BULLETIN 150

FOR UNDIVIDED RESPONSIBILITY on your installations, it pays to specify and order from one "Complete Line" source . . . SARCO-SARCOTHERM. Write for catalogs — to Sarco Company, Inc., Empire State Bldg., N. Y. 1, N. Y.

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SARCO

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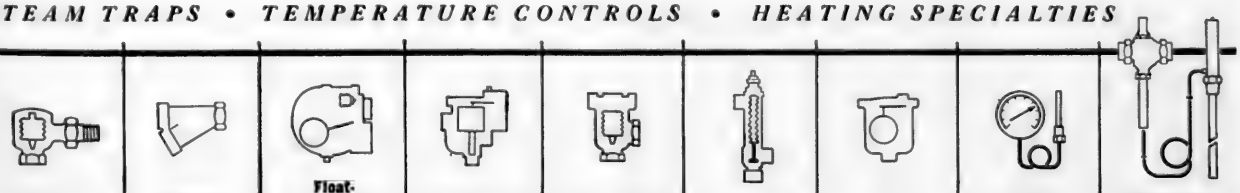
STEAM TRAPS • TEMPERATURE CONTROLS • HEATING SPECIALTIES



Radiator Valves • Traps | Strainers | Float-Thermostatic Traps | Camlift Bucket Steam Traps | Thermostatic Traps | Water Blenders | Air Eliminators | Dial Thermometers | Self-Operated Temp. Reg.

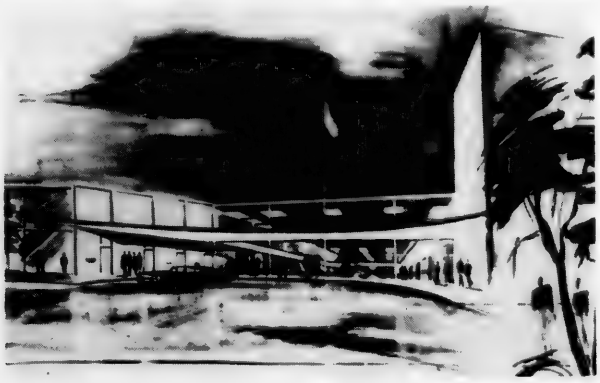
paratively rare, voltage was kept as constant as possible to prevent light flicker, but now with many appliances in use, some of which cause a slight voltage drop when starting up, the public has become accustomed to this type of disturbance and little complaint is made about it, R. W. Meisner, of Commonwealth Edison Co., Chicago, Ill., indicated. His paper, "Determination of Maximum Permissible Voltage Fluctuation Caused by ¾ Ton, 115 Volt Air Conditioning Units," was based on investigation of voltage drop caused by seven different makes of refrigerating units.

• **NO ACTION UNTIL COMPLAINT**—The investigation showed that while the units do cause some voltage drop, in general it is not a problem, but where the drop is 8 to 10 volts in borderline cases, "it is recommended that no additional service facilities be provided unless in connection with a complaint, in which special consideration should be given to correct the condition where economically feasible and possible."

NEW CONCEPT PROPOSED

to revitalize downtown Westwood, N. J., to meet competition of suburban shopping centers.

A new concept for a long overdue downtown retailing renaissance in Westwood, New Jersey, that may well provide key answers to problems shared by retailers in thousands of American cities has been advanced by Ken White Associates, industrial designers, and accepted by the municipality's Civic Association and Chamber of Commerce.



• **PROBLEM**—"Basically," says White, "the problem in Westwood is repeated all over the country. The outmoded main street shopping area is threatened with virtual extinction as a result of mushrooming suburban shopping centers. If downtown is going to compete it will have to do something about matching the spacious beauty and comfort of the suburban giant. In other words, the only really successful way to fight a shopping center is BE a shopping center."

• **PROPOSAL**—White's answer is vertical expansion keyed around an attractive air conditioned mall. Under his plan for Westwood, the main traffic artery (upper photo) is closed off and converted into a mall covered by a glass roof and air conditioned for year-round shopping comfort, as envisioned in lower photo. Parking facilities and thru-traffic arteries would be rerouted around the perimeter of this central core. Vertical expansion is accomplished by means of mezzanines encircling the mall which, in effect, become second sidewalks, doubling the amount of one-street locations. Complete job is estimated at $1¼-million.

HYDRONICS

proposed at I-B-R annual meeting as new name for science of heating and cooling with water.

Taking note of the growth of the science of heating and cooling with water, the Institute of Boiler and Radiator Manufacturers proposed a new name, Hydronics, for adoption by the industry.

Introduced by Edward F. Ford, chairman of an IBR committee, at the group's annual meeting at Absecon, N. J., hydronics was described by the speaker as one that more clearly identifies the multitude of uses of controlled water for heating and cooling.

"The industry for years has tried a number of words and phrases to tell what we make and install, but until we researched a technically correct term, hydronics, we all suffered from a profusion and confusion of terms: wet heat, liquid heat, fluid heat, and so on. With the expected adoption of hydronics by the entire industry . . . it is hoped that both the construction industry and especially the public can recognize more clearly the vital role played by water-controlled heating and cooling systems," said Ford.

Hydronics was offered by the committee after consultation with a number of engineers, manufacturers and even language specialists with the view to creating a word that was technically reflective of the role of the industry, euphonious and easy to remember.

The definition of the word by the committee is: Hydronics *(hi dron' iks), noun: see* -ics *(fr. Gr. hydro+ electronics). That science relating to hydraulic-electrical combinations, especially with reference to forced circulation of liquids for comfort heating, compatible cooling, zone temperature control, snow melting and faucet water heating.* Hydronic *(adjective)*, Hydronically *(adverb).*

• **AUTHORITIES AGREE**—Noted authorities of the English language were consulted by the committee. One of them said, hydronics "has a good sound and much to recom-

(Continued on page 130)

Remodeling Jobs Coming Your Way?
USE BETH-CO-WELD PIPE

Whenever a remodeling job comes along, chances are good you'll find several locations where steel pipe can be used to advantage. And as you know, where steel pipe is concerned, there's nothing finer than Beth-Co-Weld.

Beth-Co-Weld steel pipe is ideal for remodeling work because it's good, sound pipe, made by the continuous-weld process from an excellent grade of steel. It saves time, too, because it's so easy to cut, thread and weld.

Beth-Co-Weld is carried in black and galvanized by most jobbers, in standard and extra-strong weights, and in all popular sizes—everything from ½ in. up to and including 4 in. It is regularly furnished in 21-ft lengths, plus or minus 1 in., and is also obtainable in random lengths.

TYPICAL REMODELING JOBS FOR BETH-CO-WELD

Structural Columns . . . Plumbing and Heating Lines . . . Conduit . . . Posts and Rails for Estate Fence . . . Gate Frames . . . Hand Railings Lawn Sprinkler Systems . . . Feed Lines for Swimming Pools . . . Awning Frames . . . Antenna Supports . . . Play Area Equipment

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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

DEGREE-DAYS FOR MAY, 1957

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 29th Year of Publication of Monthly Degree-Day Data

City	May			Season to May 31, incl., from Sept. 1		
	1957	1956	Normal	1956-57	1955-56	Normal
Abilene, Texas (A)	36	0	0	2409	2585	2707
Albany, New York (A)	264	370	246	6721	7343	6888
Albuquerque, New Mexico (A)	123	20	70	4012	3855	4389
Alpena, Michigan (C)	452	487	437	7673	7955	7805
Asheville, North Carolina (C)	60	58	105	3521	4208	4067
Atlanta, Georgia (A)	31	9	20	2240	2876	2826
Atlantic City, New Jersey (C)	173	284	189	4393	5035	4717
Augusta, Georgia (A)	39	8	0	1955	2653	2138
Baltimore, Maryland (C)	64	115	73	3735	4444	4203
Billings, Montana (A)	275	286	304	7030	7525	6959
Binghamton, New York (C)	483	622	240	5878	6522	6472
Birmingham, Alabama (A)	31	5	30	2186	2859	2788
Bismarck, North Dakota (A)	307	308	355	8707	9960	8851
Block Island, Rhode Island (A)	307	464	335	5430	6081	5720
Boise, Idaho (A)	224	225	249	6088	5756	5798
Boston, Massachusetts (A)	201	304	236	5548	6096	5742
Buffalo, New York (A)	321	376	315	6187	6885	6720
Burlington, Iowa (A)	160	126	179	5814	6364	6067
Burlington, Vermont (A)	350	470	307	7509	8109	7727
Cairo, Illinois (C)	37	35	47	3425	3913	3756
Charleston, South Carolina (C)	14	4	0	1450	1886	1769
Charlotte, North Carolina (A)	35	28	29	2610	3255	3205
Chattanooga, Tennessee (A)	37	10	45	2782	3472	3384
Cheyenne, Wyoming (A)	519	310	462	7096	7155	7317
Chicago, Illinois (C)[b]	284	231	254	(a)	5937	6018
Cincinnati, Ohio (C)	91	92	108	4012	4568	4532
Cleveland, Ohio (A)	224	265	223	5553	6124	5950
Columbia, Missouri (A)	88	75	135	4506	5165	5093
Columbia, South Carolina (A)	31	9	0	2020	2708	2284
Columbus, Ohio (C)	129	171	153	4805	5509	5255
Concord, New Hampshire (A)	284	453	316	7221	7794	7462
Concordia, Kansas (C)	138	94	146	5186	5788	5303
Dallas, Texas (A)	17	0	0	2225	2328	2272
Dayton, Ohio (A)	153	184	179	5190	5836	5552
Denver, Colorado (A)	333	143	286	5785	5745	6051
Des Moines, Iowa (A)	179	149	201	6156	6885	6384
Detroit, Michigan (A)	281	310	251	6015	6497	6336
Devils Lake, North Dakota (C)	335	406	394	9496	10999	9695
Dodge City, Kansas (A)	148	87	135	4952	5166	5043
Dubuque, Iowa (A)	285	242	267	6915	7507	7159
Duluth, Minnesota (C)	475	549	487	9517	9823	9217
Elkins, West Virginia (A)	172	233	224	5128	6045	5680
El Paso, Texas (A)	19	0	0	2229	2244	2641
Ely, Nevada (A)	535	444	418	7344	7300	7177
Escanaba, Michigan (C)	443	531	471	8138	8413	8334
Evansville, Indiana (A)	82	75	90	4185	4727	4354
Fargo, North Dakota	286	361	338	8728	10188	9107
Fort Smith, Arkansas (A)	16	10	24	3057	3475	3188
Fort Wayne, Indiana (A)	209	225	226	5900	6342	6217
Fort Worth, Texas (A)	21	0	5	2377	2391	2361
Fresno, California (A)	64	49	43	2650	2582	2532
Galveston, Texas (C)	2	0	0	749	1019	1211
Grand Junction, Colorado (A)	252	71	145	6022	5089	5773
Grand Rapids, Michigan (A)	300	316	301	6447	7030	6948
Green Bay, Wisconsin (A)	385	402	347	7938	8433	8062
Greensboro, North Carolina (A)	48	69	50	3403	4110	3810
Greenville, South Carolina (A)	28	29	32	2669	3245	3060
Harrisburg, Pennsylvania (A)	137	202	128	5007	5541	5244
Hartford, Connecticut (A)	228	315	201	6162	6507	6094
Hatteras, North Carolina (C)	(a)	40	25	(a)	2846	2392
Havre, Montana (C)	220	299	313	7948	9109	8030
Helena, Montana (A)	302	331	399	7994	8472	8005
Houston, Texas (C)	1	0	0	892	1152	1276
Huron, South Dakota (A)	204	232	279	7597	9138	7796
Indianapolis, Indiana (A)	131	162	176	5108	5768	5581
Jackson, Mississippi (A)	24	0	0	1902	2429	2202
Kansas City, Missouri (A)	69	52	111	4562	5022	4880
Knoxville, Tennessee (A)	33	14	50	2895	3750	3590
La Crosse, Wisconsin (A)	254	242	250	7080	8118	7545
Lander, Wyoming (A)	414	298	396	7485	7828	8110
Lewiston, Maine (O)	308	459	344	7337	7501	7662

(a) Data not available. [b] Grant Park weather station.

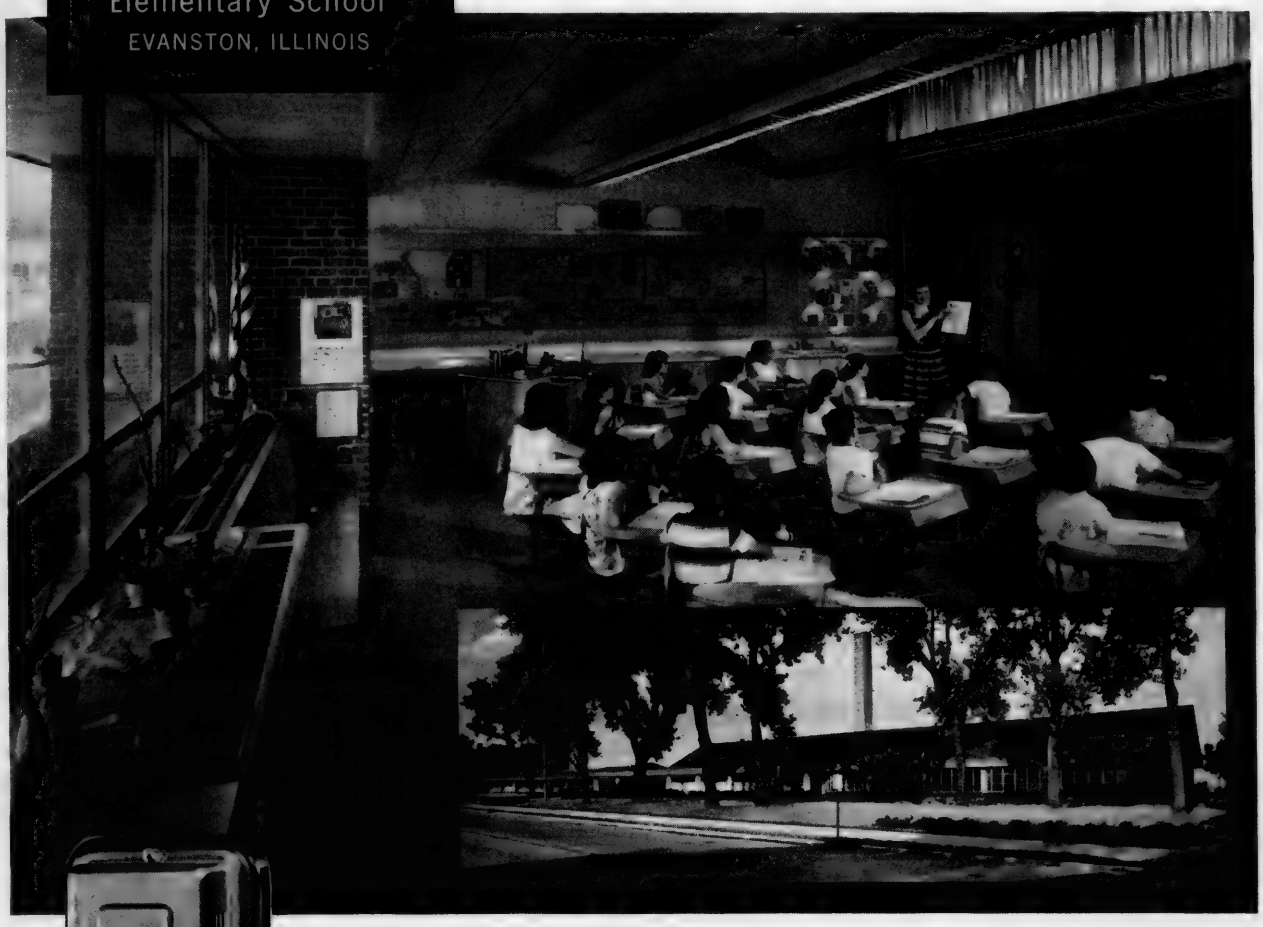
Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

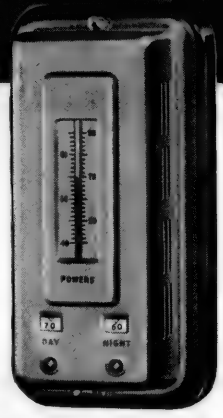
Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively.

[Table concluded on page 118]

CHARLES G. DAWES
Elementary School
EVANSTON, ILLINOIS

Architects: PERKINS & WILL, Chicago
Mechanical Engineers: E. R. GRITSCHKE & ASSOCIATES, INC.
Heating Contractor: WILLIAM A. POPE CO.





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provides utmost COMFORT and Fuel Economy

Thermal Comfort in this outstanding 25 room school helps keep teachers happy, protects health of pupils, keeps them alert and aids concentration. By preventing OVER-heated rooms Powers control also pays back its cost in lower fuel bills.

Each Powers Installation Is Individually Engineered to exactly fit the requirements of each job. Simplicity and reliable year after year operation of a Powers pneumatic control system reduces maintenance.

Planning a New School? To get the biggest return on the investment in automatic temperature control ask your architect or engineer to include a Powers 2-Temperature system. For further information call our nearest office or write us direct.

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DAY NIGHT POWERS 2-Temperature Control System

It Stops Fuel Losses due to wasted heat in unoccupied rooms.

17 classrooms in the Dawes School, also the gymnasium, auditorium, office, multipurpose and conference rooms, library, teachers lounge and music room . . . all are equipped with Powers Day-Nite Thermostats. Each is adjustable for normal temperatures during occupancy or lower temperatures during unoccupied periods. (e81)

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SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*

65 years of Automatic Temperature and Humidity Control

Degree-Days for May, 1957 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 29th Year of Publication of Monthly Degree-Day Data

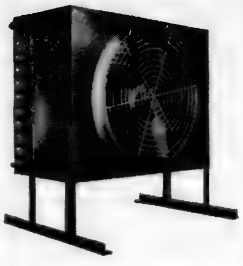
City	May			Season to May 31, incl., from Sept. 1		
	1957	1956	Normal	1956-57	1955-56	Normal
Lincoln, Nebraska (C)	162	111	172	5502	6273	5826
Little Rock, Arkansas (A)	22	12	18	2729	3117	2982
Los Angeles, California (C)	44	74	68	963	1511	1432
Louisville, Kenucky (A)	86	90	94	4070	4507	4434
Lynchburg, Virginia (A)	67	108	82	3808	4429	4148
Macon, Georgia (A)	15	0	0	1686	2260	2049
Madison, Wisconsin (A)	302	269	266	6947	7391	7181
Marquette, Michigan (C)	462	560	477	8094	8311	8184
Memphis, Tennessee (A)	25	7	24	2788	3255	3137
Meridian, Mississippi (A)	21	1	9	1892	2445	2333
Milwaukee, Wisconsin (A)	381	370	351	7019	7169	7044
Minneapolis, Minnesota (A)	263	246	259	7472	8558	7748
Moline, Illinois	191	155	199	6090	6583	6311
Montgomery, Alabama (A)	11	0	0	1686	2280	2137
Nashville, Tennessee (A)	45	21	43	3108	3735	3513
New Haven, Connecticut (A)	228	355	261	5699	6186	5956
New Orleans, Louisiana (C)	2	0	0	765	1171	1175
New York, New York (C)	133	261	153	4694	5320	5032
Newark, New Jersey	132	218	148	4832	5433	5241
Norfolk, Virginia (A)	59	121	59	2984	3698	3454
North Platte, Nebraska (A)	290	183	243	6610	7166	6470
Oak Ridge, Tennessee	38	22	58	2877	3856	4028
Oakland, California (A)	130	185	212	2781	3145	2883
Oklahoma City, Oklahoma (A)	72	14	38	3753	3912	3519
Omaha, Nebraska (A)	159	114	175	5773	6550	6123
Parkersburg, West Virginia (C)	102	144	119	4386	4878	4737
Peoria, Illinois (A)	159	124	192	5661	6077	6035
Philadelphia, Pennsylvania (C)	113	163	93	4223	4871	4523
Phoenix, Arizona (A)	7	0	0	1229	1318	1492
Pittsburgh, Pennsylvania (C)	118	184	137	4636	5279	5035
Pittsfield, Massachusetts	329	460	336	7189	7953	7501
Pocatello, Idaho (A)	324	253	317	7060	6814	6840
Portland, Maine (A)	331	516	394	7334	7855	7493
Portland, Oregon (C)	143	161	199	4280	4218	4046
Providence, Rhode Island (A)	222	365	258	5761	6355	6041
Pueblo, Colorado (A)	230	98	203	5361	5506	5682
Raleigh, North Carolina (A)	59	65	29	3067	3742	3075
Rapid City, South Dakota (A)	336	270	357	7259	7604	7331
Reading, Pennsylvania (C)	133	197	123	4789	5310	5044
Red Bluff, California (A)	74	84	51	2599	2658	2546
Reno, Nevada (A)	348	309	318	6095	5921	5783
Richmond, Virginia (A)	63	107	66	3559	4213	3955
Rochester, New York (A)	311	407	289	6451	7187	6766
Roswell, New Mexico (A)	33	6	28	3184	3436	3424
Sacramento, California (C)	73	69	85	2492	2421	2595
St. Joseph, Missouri (A)	106	77	101	6098	5780	4692
St. Louis, Missouri (C)	70	66	94	4270	4640	4462
Salt Lake City, Utah (A)	238	172	233	5731	5560	5785
San Antonio, Texas (A)	7	0	0	1210	1456	1579
San Diego, California (A)	53	57	97	1009	1509	1513
Sandusky, Ohio (C)	220	265	217	5606	6090	5818
San Francisco, California (C)	215	238	248	2367	2681	2523
Sault Ste. Marie, Michigan (A)	481	633	499	8854	9140	9016
Savannah, Georgia (A)	20	1	0	1486	2006	1710
Scranton, Pennsylvania (A)	264	338	196	6192	6765	5994
Seattle, Washington (C)	147	179	246	4371	4683	4237
Sheridan, Wyoming (A)	352	308	387	7454	7940	7674
Shreveport, Louisiana (A)	15	0	0	1912	2190	2117
Sioux City, Iowa (A)	209	154	228	6509	7407	6933
Spokane, Washington (A)	186	252	330	6830	6994	6661
Springfield, Illinois (A)	125	120	127	5219	5743	5211
Springfield, Missouri (A)	57	62	118	4272	4803	4669
Syracuse, New York (A)	300	386	247	6407	7172	6454
Toledo, Ohio (A)	236	271	245	6046	6684	6322
Topeka, Kansas (C)	110	59	112	4797	5249	4906
Trenton, New Jersey (C)	133	209	133	4764	5324	5057
Tulsa, Oklahoma	36	29	44	3485	3765	3584
Utica, New York (O)	388	393	253	7511	7417	6796
Valentine, Nebraska (A)	320	241	288	7216	7901	6971
Walla Walla, Washington (C)	109	158	171	5235	5335	4810
Washington, D. C. (C)	68	115	80	3881	4414	4258
Wichita, Kansas (A)	103	52	101	4581	4891	4564
Williston, North Dakota (C)	262	338	360	8608	9735	8859
Winnemucca, Nevada (A)	364	307	299	6571	6282	6241
Yakima, Washington (A)	104	154	205	6223	6583	5785

For footnotes, see page 116.

SO HALSTEAD & MITCHELL ENGINEERS SAID:

NOW - YOU CAN BUY AN AIR-COOLED CONDENSER WITH LIFETIME HIGH CAPACITY

TURBU-FLO FINNED COILS WON'T CLOG



Here is the industry's finest air-cooled condenser using the exclusive non-clog "Turbu-Flo" finned coil. In this most efficient Halstead & Mitchell design, wide fin spacing prevents the coil clogging with air-borne dirt and other particles which cause a quick loss in condenser capacity. Thus, Halstead & Mitchell's high condenser capacity is built-in, for lifetime operation.

As a best starting point, Halstead & Mitchell uses a generously big coil, with fins spaced 6 to the inch. This means a low pressure drop, which in turn means high operating efficiency. The "Turbu-Flo" fin itself contributes to an extra-measure of heat transfer, providing a marked turbulence of air flow over the finned surface. This results in increased heat transfer due to lowered air film resistance. Thus, there's a generous reserve of capacity in these Halstead & Mitchell Air-Cooled Condensers—capacity which will stay high for the life of the unit.

The exceptionally rugged construction, the manifolding for easy multi-circuiting, and the right price make Halstead & Mitchell air-cooled condensers preferred by contractors everywhere. More details are yours for the asking—write for free Condenser Bulletin. *Halstead & Mitchell, Bessemer Building, Pittsburgh 22, Pa.*

AT LEADING WHOLESALERS EVERYWHERE

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Publications abstracted in this department should be ordered direct from publisher

ENGINEERING THERMODYNAMICS

The present book, Engineering Thermodynamics, by C. Osborn Mackey, head of the Department of Thermal Engineering, and William N. Barnard, late director, Sibley School of Mechanical Engineering, and Frank O. Ellenwood, head of the Department of Heat-Power Engineering, all of Cornell University, is an outgrowth of Heat-Power Engineering by William N. Barnard, Frank O. Ellenwood and Clarence F. Hirshfield.

Basic principles of engineering thermodynamics, including properties and processes of real gases, are set forth in the first six chapters. Later chapters give extended treatment to such topics as one-dimensional flow of ideal gases with area change, friction and heat transfer, properties of mixtures of ideal gases, ideal gas reactions, energy transformations in turbines, power cycles with real fluids, refrigeration, and air conditioning.

The text has been written for students who have had the usual prerequisites of mathematics, physics, chemistry and mechanics.

Engineering Thermodynamics, by C. O. Mackey, W. N. Barnard, and F. O. Ellenwood. Cloth bound, 6 x 9 inches, 428 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $7.95.

THE GUIDE

The 1957 or 35th edition of the Heating Ventilating and Air Conditioning Guide, published by the American Society of Heating and Air-conditioning Engineers, has a technical section of 1250 pages which is 70 pages more than the previous edition.

Two completely revised and rewritten chapters are Chapter 9 on heat transmission coefficients of building materials, and Chapter 44 on control of the industrial environment.

The 51 chapters are grouped into 7 sections as follows: Fundamentals; human reaction; heating and cooling loads; combustion and consumption of fuels; systems and equipment; special systems; instruments and codes.

Included is a 24 x 32 in. ASHAE psychrometric chart.

Heating Ventilating and Air Conditioning Guide, 1957. Cloth bound, 6 x 9 inches, 1250 pages plus a catalog section. Published by the American Society of Heating and Air-conditioning Engineers, 62 Worth St., New York 13, N. Y. Price, $12.

TERMS IN NUCLEAR SCIENCE AND TECHNOLOGY

There has been such an interest in the field of nuclear energy, that there soon developed the need for a glossary of nuclear terms. The ASME formed a Nuclear Energy Glossary Committee consisting of representatives from various fields. This ASME Nuclear Energy Glossary Committee prepared the glossary terms and definitions in nine sections as follows:

Physics, reactor theory, reactor engineering, chemistry, chemical engineering, biophysics and radiobiology, instrumentation, isotopes separation and metallurgy.

Terms in Nuclear Science and Technology, published by The American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y. Paper bound, 5½ x 8½ inches, 188 pages. Price, $5.

NDHA PROCEEDINGS

The National District Heating Association has just issued the proceedings of its 47th annual meeting that was held at Williamsburg, Va., June 4 to 7, 1956. The proceedings contain reports of the various committees, the various papers presented, and the discussion that followed. It also contains the constitution and by-laws of the association.

1956 Proceedings of the National District Heating Association. Cloth bound, 6 x 9 inches, 173 pages. Published by the National District Heating Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. Price, $7.50.

• • •

EMBEZZLEMENT CONTROLS FOR BUSINESS ENTERPRISES—A booklet on methods employers can use to reduce the risk of embezzlement loss was prepared by Lester A. Pratt, C.P.A. For a free copy write on business letterhead to Fidelity and Deposit Company of Maryland, Baltimore 3, Md.

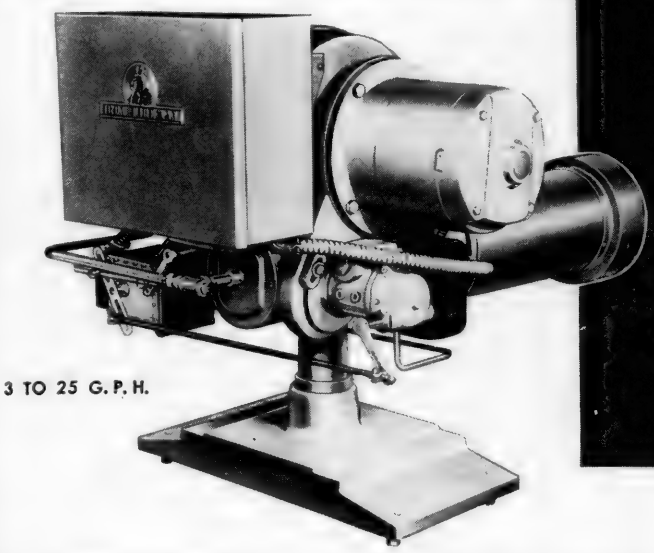
WINDOWS AND GLASS IN BUILDING EXTERIORS — Publication 478 of the Building Research Institute, the papers presented at an institute conference in Washington, D. C., on Windows and Glass in the Exterior of Buildings. The papers, 22 in all, are divided into groups of functions of the building environment, product engineering, controls and design applications. All of these papers are now available in a paper bound book of 176 pages which may be purchased from the Building Research Institute, Division of Engineering and Industrial Research, Washington, D. C. Price, $5.

SMALL SIZE PIPE FOR SANITARY LATERAL SEWERS — A report has been issued on A Study of Small Size Pipe for Sanitary Lateral Sewers, conducted by the Building Research Advisory Board for the Federal Housing Administration. This is solely an advisory report for the benefit of the FHA. Building Research Institute, 2101 Constitution Ave., Washington 25, D. C.

IMPINGEMENT TARGET BURNERS — AGA Laboratories research bulletin No. 75 has been issued on The Design and Application of Impingement Target Burners. It presents an analysis of the effects of various burner design factors on the operating characteristics of burners with flame spreaders. The application of this type of burner is demonstrated in a water heater, a range top section, and a central heating furnace. American Gas Association, 420 Lexington Ave., New York 17, N. Y. Price, $2.

IRON FIREMAN MicroMist TRADE MARK BURNER

Two-stage atomizing principle reduces heavy oil to a microscopic mist



The first *REALLY NEW* oil burner in thirty years

Burns any fuel oil through heaviest No. 5. With the MicroMist low-pressure atomizing oil burner, heavy oils, through *heavy* No. 5, are reduced to minute particles having the characteristics of a gas rather than a spray. The oil is so finely divided that it becomes an oil mist or fog that will remain in air suspension for several hours. It is easily ignited by an electric spark (does not require gas ignition).

Two-stage atomizer. The heart of the Iron Fireman MicroMist burner is an ingenious supercharger, or compressor. This compressor-atomizer first reduces the oil to an air mixed spray (which is as far as other burners go), then by the heat of compression, to a microscopic air-oil vapor.

Heavy oils can't clog nozzle. The nozzle directs the highly combustible vapor into the firebox. Unlike other oil burners, the nozzle is *not* a critical part, because it has nothing to do with atomization. There are no small passages subject to clogging.

Heating of oil is required only for the heavier grades of No. 5, and then only for starting or pumping.

Look at these additional features. The Iron Fireman MicroMist burner is as easily installed as a conventional gun type burner. It has two important uses: as a conversion burner or as a component part of a packaged boiler-burner unit. No special boiler front or boiler pitting is required. The choice of oil grades is almost unlimited. Integral control panel is wired and tested at the factory. Fuel and maintenance costs are low. It fires low-cost heavy oils with little more attention than a domestic oil burner. Available for low fire start, high-low or modulating firing.

The Iron Fireman MicroMist burner is ideal for commercial heating installations. Mail coupon for more information.

Po'keepsie Motor Hotel provides heat and hot water through winter at a cost of 13 cents per day per room

Mr. Charles Michel, manager, writes:

"Our Iron Fireman MicroMist burner uses an inexpensive, No. 4, oil in our 53-room deluxe motel. From October 1, 1956 to March 1, 1957, our fuel bill for the heating and domestic hot water amounted to $1,233.00, or 13c per room per day.

"This burner has not required daily attention and the overall maintenance cost has been extremely small."

The steam heating system in the Po'keepsie Motor Hotel uses the revolutionary Iron Fireman SelecTemp room heating units with individual room temperature control—"a thermostat in every room." SelecTemp heating is used in conjunction with individual room cooling units.

IRON FIREMAN®

Automatic firing equipment for oil, gas, coal

IRON FIREMAN MANUFACTURING COMPANY
3353 W. 106th Street, Cleveland 11, Ohio
(In Canada, 80 Ward Street, Toronto, Ont.)

Please send literature and specifications on the Iron Fireman MicroMist burner.

Name_____

Firm_____

Address_____

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CONTROL

install

FLEXAUST®

HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of fume and dust control, and ventilation uses.
Extremely flexible, durable, and lightweight.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

Write for details today
Distributors
in all principal cities

THE FLEXAUST COMPANY
Dept. HV-7
PARK AVE. NEW YORK 17, N. Y.

NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

PRESSURE REGULATORS—Plant engineers and other specialists in the control and regulation of the flow of steam and other fluids will be interested in a 4-page brochure (No. 1011) on pressure regulators published by Spence Engineering Co., Inc., Walden, N. Y. Selection data with photographs are presented on three principal types of main valves and pilots. Also illustrated by line drawings are three suggested applications of regulators. A steam capacity table for the selection of main valve size is also shown.

Circle **Item 72** on Inquiry Card

LINE OF TEMPERATURE CONTROLS — The White-Rodgers Co., St. Louis, Mo., has announced distribution of a 1957 catalog that covers the company's complete line of temperature controls. Entitled Automatic Controls for Heating, Air Conditioning and Refrigeration, the fully-illustrated, three-color book includes in catalog form the company's room thermostats, PushButton heating-cooling thermostats, combination hot water limit-circulator relay controls, and new gas controls.

Circle **Item 73** on Inquiry Card

HIGH EFFICIENCY AIR FILTERS—Bulletin 120, published by Cambridge Filter Corp., Syracuse, N. Y., shows comparable efficiencies, based on the three standard tests, of various types of filters, defines high-efficiency filtration and gives basic information n filter selection. It shows how the interchangeable - cartridge arrangement of the company's filters permits a simple change to higher or lower efficiencies to meet changing conditions and makes possible proper high-efficiency filtration at minimum cost.

Circle **Item 74** on Inquiry Card

ABRASIVE CUTTING MACHINES — A revision of the Abrasive Cutoff Bulletin AB-457 has been produced by Beaver Pipe Tools, Inc., Warren, Ohio. The new bulletin gives specifications, descriptions, illustrations, cutting times, and many other important features concerning the wide and varied line of the company's abrasive cutting machines.

Circle **Item 75** on Inquiry Card

SILVER ALLOY BRAZING — Available from Handy & Harmon, New York, N. Y., is 4-page news Bulletin No. 76 describing applications of the manufacturer's silver brazing alloys. Also featured is a new powdered aluminum-silicon alloy and flux mixture for joining aluminum assemblies.

Circle **Item 76** on Inquiry Card

DIRECT-FIRED HEATERS — Complete description and specifications on the company's line of stainless steel direct-fired heaters are included in a new bulletin published by Reznor Manufacturing Co., Mercer, Pa. These units are designed for large commercial and industrial space heating applications.

Circle **Item 77** on Inquiry Card

VALVES AND CONTROLS — Two new catalogs have been released by Detroit Controls Corp., Detroit, Mich. One is Catalog No. 100-F describing automatic controls and solenoid valves for engine protection and industrial applications. The other, Catalog No. 800, gives complete information on industrial valves for steam, water, air, oil or gas applications.

Circle **Item 78** on Inquiry Card

AIR VELOCITY MEASUREMENT — A fully illustrated 20-page booklet from Illinois Testing Laboratories, Inc., Chicago, Ill., explains how the company's Velometer can be used for measuring air velocities in large open areas, at supply openings, at suction openings or inside ducts. The complete manual of instructions is of value not only to users of the company's device but to all concerned with the measurement of air velocities.

Circle **Item 79** on Inquiry Card

SINGLE-PHASE INDUCTION MOTORS — Bulletin GEC-1419, available from General Electric Co., Schenectady, N. Y., gives application data, types, ratings, frame sizes, and construction features of dripproof and enclosed single-phase induction motors, in sizes from ¾ to 5 hp, used for applications such as fans, blowers, pumps, air and refrigeration compressors, and general purpose applications.

Circle **Item 80** on Inquiry Card

GAS PRESSURE REGULATORS — A forty-page catalog covering their complete line of pressure regulators for industrial compressed gases is available from Air Reduction Sales Co., Div. of Air Reduction Co., Inc., New York, N. Y. Entitled Gas Regulators, Catalog 806 deals with various types of cylinder, manifold, and pipeline regulators, both single- and two-stage, and a variety of specialized equipment such as laboratory and metering regulators and gas proportioners. Flow and pressure charts in graph form give data on the performance of the regulators.

Circle **Item 81** on Inquiry Card

LARGE-DIAMETER PROPELLERS—New, large-diameter propellers for cooling towers and heat exchanges are described and illustrated in 4-page Bulletin 510 published by Aerovent Fan Co., Inc., Piqua, Ohio. Cast-aluminum blades permit full interchangeability in any assembly, simplify installation and maintenance.

Circle **Item 82** on Inquiry Card

MOTOR MAINTENANCE — In February issue, two colored sound slide films which show maintenance people how to install and properly maintain electric motors were announced as available from Allis-Chalmers Mfg. Co., Milwaukee, Wis. The stories which these films told are now available from the company in Bulletins 51X8581 and 51X8582.

Circle **Item 83** on Inquiry Card

MULTI-ZONE AIR CONDITIONERS — Worthington Corporation, Harrison, N. J., announces the availability of a 36-page bulletin, No. C-1100-B98-P, on its multi-zone air conditioning units. The index bulletin is graphically illustrated and contains specification data and physical data of the units' component parts; engineering and design features; direct expansion cooling coil data and ratings; sample problem tables for chilled water cooling coils and hot water heating coils; and dimension sheet and specification data for architects or engineers.

Circle **Item 84** on Inquiry Card

HIGH TEMPERATURE TUBING — Engineers involved in the design, construction, and operation of equipment involving the use of tubing and piping at elevated pressures and temperatures, will be interested in the up-to-date information contained in Bulletins 145A and 152A issued by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa.

Circle **Item 85** on Inquiry Card

EMBOSSED ALUMINUM SHEETS — A pocket-size pamphlet on embossed aluminum finishes, containing specifications for pattern, temper, thickness and widths, complete with actual samples of the aluminum sheet is available from Fairmont Aluminum Co., Fairmont, W. Va., a subsidiary of Cerro de Pasco Corporation. Use of embossed finish sheet for added rigidity and permanent finish, resisting marring during fabrication and in service, plus the possibility in many cases of using a thinner material than possible in plain sheet, is discussed.

Circle **Item 86** on Inquiry Card

PLASTIC PIPE AND FITTINGS — Now available from Franklin Plastics, Inc., Franklin, Pa., is a 16-page catalog describing their complete line of Dur-X plastic pipe, tubing and fittings. Complete data and specifications for three grades of polyethylene pipe are included with descriptive information on physical properties. The new catalog also contains instructions and suggested methods for installation of plastic pipe and typical applications for plastic tubing.

Circle **Item 87** on Inquiry Card

(Continued on page 124)

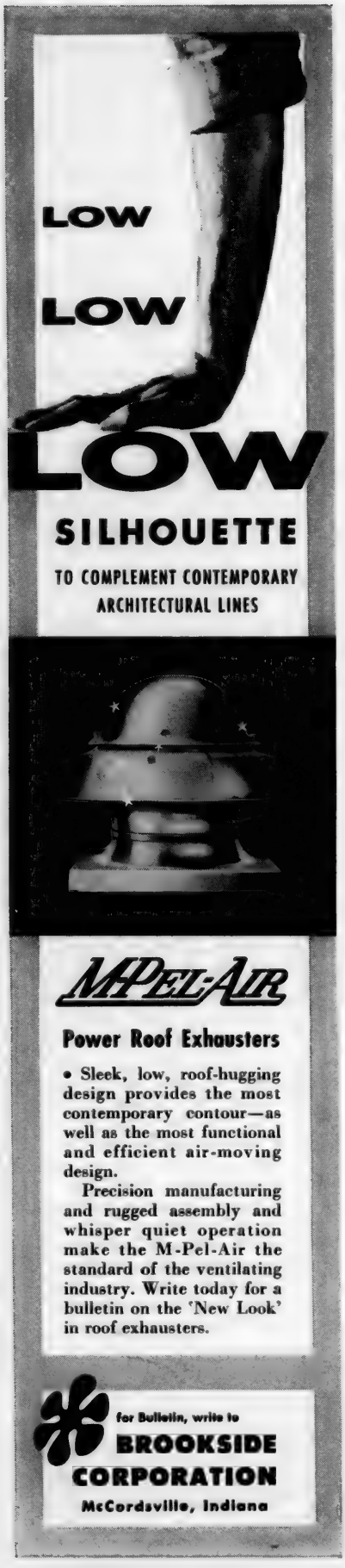
Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

Throw away your concrete drills...

it drills its own hole!

No expensive masonry drills or explosive charges needed. Every RED HEAD Concrete Fastener is its own drill! Installed by hand or impact hammer, the RED HEAD drills its way into the toughest concrete and ONCE IT'S IN...IT'S IN FOREVER! Can't pull out, rust out, melt out or shake loose. Costs less installed than any other means of concrete fastening. Write today for catalog and free sample Job site demonstration can be arranged.

PHILLIPS®
RED HEAD
CONCRETE FASTENERS
the original *since 1916*
PHILLIPS DRILL COMPANY, MICHIGAN CITY 6, INDIANA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SILHOUETTE
TO COMPLEMENT CONTEMPORARY
ARCHITECTURAL LINES
M-PEL-AIR
Power Roof Exhausters
• Sleek, low, roof-hugging design provides the most contemporary contour—as well as the most functional and efficient air-moving design.
Precision manufacturing and rugged assembly and whisper quiet operation make the M-Pel-Air the standard of the ventilating industry. Write today for a bulletin on the 'New Look' in roof exhausters.
for Bulletin, write to
BROOKSIDE
CORPORATION
McCordsville, Indiana

NEW CATALOGS

(Continued from page 123)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

HANDLING CORROSIVE FUMES — An illustrated 4-page folder, dealing with the extensive and costly problems of corrosive fumes and atmospheres, entitled, Exhaust Fumes from Corrosive Chemicals, is available from Heil Process Equipment Corp., Cleveland, Ohio. Equipment featured in this pamphlet includes centrifugal and axial-type plastic fans, rubber-lined and coated centrifugal-type steel blowers, plastic or rubber-lined ejector units, and coated axial fans for practical and economical handling of damaging corrosive fumes.

Circle **Item 88** on Inquiry Card

SELF-CONTAINED BOILERS — Eight-page brochure (AD-162) describes in detail the complete line of Model CB boilers available from Cleaver-Brooks Co., Milwaukee, Wis. This attractive bulletin with a four-color cover, highlights design features of these industrial boilers. The bulletin describes unusual fuel flexibility, four-pass, forced draft design, unified electric and steam preheater, quiet vibrationless impeller, and hinged doors with built-in refractory.

Circle **Item 89** on Inquiry Card

TANK HEATER SELECTION—Selecting the proper Hydro-Flo tank heater or tank-and-heater combination has been made easy by engineering bulletin No. HK-456, available from Bell & Gossett Co., Morton Grove, Ill. Designed specifically to help solve heating engineering problems, the bulletin combines a temperature factor table with capacity curves and an extensive list of dimensions, surface areas, and tables of ratings for tank heaters.

Circle **Item 90** on Inquiry Card

ZINC-COATED STEEL—A 12-page bulletin, Form 571, is available from Weirton Steel Co., Div. of National Steel Corp., Weirton, W. Va. It describes the versatility of the company's zinc-coated steel, called Weirkote, in such applications as heating, ventilating, and air conditioning duct work, construction materials, and equipment fabrication.

Circle **Item 91** on Inquiry Card

BOILER-BURNER UNITS — The company's complete line of boiler-burner units is described in Bulletin 900 released by International Boiler Works Co., East Stroudsburg, Pa. These units have the performance features of water tube boilers, plus the advantages of burner selection, separate delivery, and local service.

Circle **Item 92** on Inquiry Card

REVERSIBLE GEARED MOTORS—Catalog No. GR-2 describes reversible geared motors manufactured by Small Motors Div., Barber-Colman Co., Rockford, Ill. The motors are designed for use in servomechanisms, voltage regulators, combustion and industrial controls, and are available for 6 to 220-volt a-c with starting torques to 50 lb in.

Circle **Item 93** on Inquiry Card

INDUCTION SYSTEM BALANCING—A new manual, No. D-425B, outlining the proper method of balancing induction air conditioning systems is available from The Trane Company, La Crosse, Wis. Balancing the primary air and secondary water systems on induction air conditioning systems can only be done properly if a preliminary analysis is made and an orderly method of procedure followed. Prepared principally as a guide for contractors, the new bulletin uses photos, copy, and graphs to describe the step-by-step balancing procedure.

Circle **Item 94** on Inquiry Card

PLASTIC PIPE AND FITTINGS—A booklet containing the latest technical information on pressure-rated plastic pipe and fittings has been published by Crane Co., Chicago, Ill. The new 8-page booklet includes complete tables on pressure drop through plastic pipe, pressure-temperature ratings for different sizes, and recommended pumping depths. Figures are given on the company's three grades of polyethylene pipe: standard wall, 75-lb, and 100-lb.

Circle **Item 95** on Inquiry Card

BOILER CONTROLS—A handsome new merchandising help for wholesalers and contractors is this double duty wall poster produced by McDonnell & Miller, Inc., Chicago, Ill. On one side of the 18 x 23-inch wall poster is the message: "Anybody want to buy a cheap parachute?" It preaches the idea of buying quality in all heating equipment. On the other side is a discussion of medium pressure boiler jobs, up to 150 psi, and the company's pump controls and make-up water feeders which apply.

Circle **Item 96** on Inquiry Card

USES OF LITHIUM—Presenting Lithium, a fifteen-page tabbed booklet, has been issued by the recently formed American Lithium Institute, Princeton, N. J. The booklet describes the properties, uses, research potentials and availability of lithium and its unique compounds and discusses the function of the Institute itself. The current uses of lithium and its compounds in ceramics, automotive greases, air conditioning and welding and brazing are reviewed as are applications in alkaline storage batteries, metals refining, and organic synthesis.

Circle **Item 97** on Inquiry Card

(Continued on page 126)

THE MOTORPUMP

IS ALWAYS A GOOD

sales point

Customers buying air conditioning systems are vitally interested in the various components that make up the system. They want brand names they know and recognize . . .

When you offer Ingersoll-Rand Motorpumps as an integral part of the systems you sell, your customers are getting dependable, trouble-free service from compact pumps designed specifically for air conditioning service. *You* get easy installation, fewer service calls . . . and more satisfied customers.

Motorpumps are available from 1/4 to 75 horsepower. Write for our latest literature on Motorpumps for air conditioning service.

9-595

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

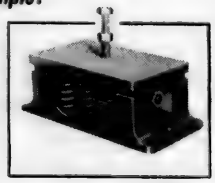
Heavy fans, pumps, compressors and other equipment mounted on Korfund vibration and noise control mounts run smooth and quiet. Machinery installations can be made anywhere in a building without fear of annoyances. Whether you're planning to install new mechanical equipment, or are troubled by your present system it will pay you to call Korfund.

Korfund offers a complete line utilizing springs - rubber - cork alone or in combination...

For Example:

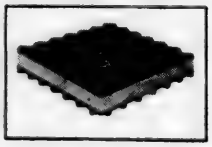
Vibro-Isolators

For Critical Installations. Spring assembly floats vibrating equipment, stops vibration and noise transmission. Satisfaction guaranteed.



Elasto-Rib

For non-critical installations. Multi-purpose cushion dampens noise, economically checks vibration.



Bulletin No. 48 describes the Korfund line and tabulates isolation requirements for different types of equipment and building conditions. Yours for the asking—write today.

THE KORFUND COMPANY, INC.

48-01E Thirty Second Place
Long Island City 1, N. Y.

In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

NEW CATALOGS

(Continued from page 124)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

PIPE, EQUIPMENT INSULATION—A set of six specifications covering the application of the company's Foamglas insulation for use on industrial equipment and piping is available from the Pittsburgh Corning Corp., Pittsburgh, Pa. Each booklet contains tables of suggested thicknesses of insulation to be applied, detail drawings of installation procedure, insulation supports, and recommended finishes.

Specification FI-104A on low temperature equipment and piping (below 70 deg F).

Circle **Item 98** on Inquiry Card

Specification FI-104B on medium temperature equipment and piping (70 to 212 deg F).

Circle **Item 99** on Inquiry Card

Specification FI-104C on high temperature equipment and piping (above 212 deg F).

Circle **Item 100** on Inquiry Card

Specification FI-104D on dual temperature equipment and piping (—300 to 400 deg F).

Circle **Item 101** on Inquiry Card

Specification FI-104E on underground piping.

Circle **Item 102** on Inquiry Card

Specification FI-104F on insulation of spheres (temperatures between 70 and —25 deg F).

Circle **Item 103** on Inquiry Card

RAMFEED STOKERS—A 12-page multicolor brochure, No. 456, illustrating the firm's Lo-set ramfeed stokers has been announced by the Canton Stoker Corp., Canton, Ohio. Prominent attention is given to the company's synchronized combustion controls that keep coal feed, forced air and stack draft in positive balance, as well as a system for smoke control.

Circle **Item 104** on Inquiry Card

INDUCED DRAFT FANS—A four-page bulletin No. SI-102, describing their Spid induced draft fans for use with boilers ranging from 5 to 214 hp has been released by Chicago Blower Corp., Franklin Park, Ill. The illustrated bulletin contains performance tables, dimensions, sample specifications and construction features for both the cast iron direct drive and steel plate V-belt drive induced fans. It also contains a fan selection table.

Circle **Item 105** on Inquiry Card

AIR-COOLED CONDENSER—Literature on the Dricon air-cooled condenser, No. 34C7A, has been released by the Recold Corporation, Los Angeles, Calif. Showing specifications and dimensions regarding 5 models, the new literature also includes a condenser performance chart. This performance chart is unique in that it corrects the ratings not only for variations in suction temperature, but also for those variations in condensing temperature.

Circle **Item 106** on Inquiry Card

PACKAGED BLOWER UNITS — A 28-page illustrated catalog (Bulletin 8414) describing the new line of HS Utility Sets is available from American Blower Division of American-Standard, Detroit, Mich. The bulletin describes the features and advantages of the units. Selection factors, such as space volume, quantity of fresh air required, altitude and temperature correction, outlet velocity, duct size, static pressure and tip speed are thoroughly discussed. As an aid to architects, engineers and fan buyers in the application of the selection factors, tables of minimum outdoor air requirements, recommended duct velocities, outlet velocity and tip speed values for backward inclined blade fans and correction ratios for temperature and altitude are included.

Circle **Item 107** on Inquiry Card

WATER VAPOR RECORDER — The M-S-A Continuous Water Vapor Recorder for measuring low concentrations in streams of air or various gases for process industries and gas pipelines is described in Bulletin No. 0714-1 by Mine Safety Appliances Co., Pittsburgh, Pa. It explains and illustrates the principle of operation, which is based on measurement of heat energy exchange when a gas is adsorbed or desorbed from the surface of a solid adsorbent, and gives typical applications.

Circle **Item 108** on Inquiry Card

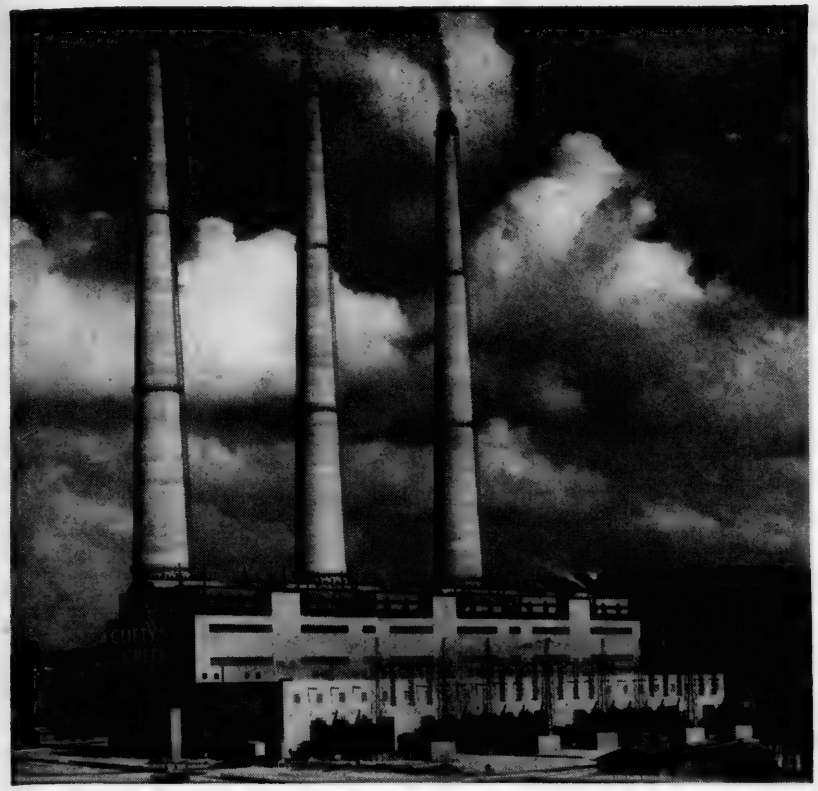
ASBESTOS TEXTILES—Selecting asbestos textiles for any application or temperature range is now simplified by the fact-loaded reference manual, No. 76-327, published by Union Asbestos & Rubber Co., Bloomington, Ill. Designed to fit standard source files, this 16-page book contains all the information a product engineer or designer needs to guide his selection of asbestos textiles for any use from blast furnace door packing to theater curtaining.

Circle **Item 109** on Inquiry Card

INSTRUMENTS AND CONTROLS—A digest of specifications of instruments and controls manufactured by The Hays Corporation, Michigan City, Ind., is offered in their new 12-page condensed catalog, designated Publication 57-687-297.

Circle **Item 110** on Inquiry Card

(Continued on page 128)



GIANT ON THE OHIO. Clifty Creek Plant at Madison, Ind., is the world's largest investor-owned power plant—with a 1,290,000 kilowatt capacity. The complex air conditioning requirements for this "big job" were met efficiently by General Electric Zone-by-Zone method.

General Electric

ZONE-BY-ZONE

Air Conditioning chosen for largest power plant ever built by industry

When air conditioning was selected for the giant Clifty Creek power plant, the engineers chose General Electric Zone-by-Zone method. Not only was this system most economical to install—but its flexibility permits a continuing economy in cooling costs.

General Electric Air Conditioning can be installed step-by-step, if desired, so that the investment at any time can be kept relatively low. Space presents no problem—ceiling-mounted units take no floor space and floor-mounted units may be stationed out of space. These smartly streamlined units are self-contained, trouble-free. And you'll always go right specifying General Electric products.

You owe it to your clients to consider General Electric Zone-by-Zone Air Conditioning in economically planning their requirements. General Electric Company, Commercial and Industrial Air Conditioning, 5 Lawrence Street, Bloomfield, N. J.

Progress Is Our Most Important Product

GENERAL ELECTRIC

In Canada, Canadian General Electric Co., Ltd., Montreal

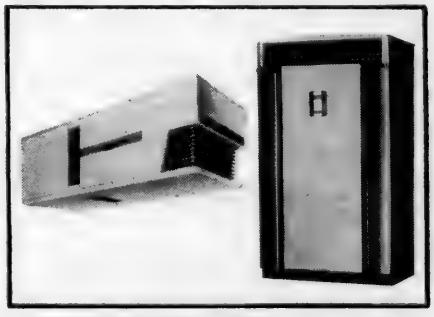
EACH ZONE INDIVIDUALLY COOLED BECAUSE EACH UNIT INDIVIDUALLY CONTROLLED

You air condition only the areas you need when you need it.

CONTROL ROOM at base of each of three stacks—tallest in the world—adequately air conditioned by 2 General Electric 10 ton Units. Third unit (located out of space) serves foreman's offices. Each of the 3 control rooms is air conditioned by General Electric Units in a similar manner.

CAFETERIA receives its cooling from a 10 ton and a 7½ ton unit. When area served is not in use, Zone-by-Zone Air Conditioners may be turned off without affecting other areas.

LOCKER ROOMS air conditioned by a 3 ton unit. In addition, all offices and laboratory have General Electric Zone-by-Zone Air Conditioning.



CEILING-MOUNTED UNITS *take no floor space*—available in 3, 5 and 7½ ton capacities, water-cooled; 3 and 5 ton air-cooled; **FLOOR-MOUNTED UNITS** in 3, 5, 7½, 10 and 15 ton capacities.

3 HOW TO SOLVE THE BIG PROBLEMS of Heating System Design

KEEP COSTS DOWN

The cost of Reznor unit heaters is comparable to or lower than that of other types of equipment of equal heating capacity. And with Reznor, this is the total cost. You don't have to add the costs of extensive piping and valves or duct work, and of radiators or registers. Reznor gas unit heaters produce and distribute heat at the point of need. To install them involves only suspension, venting and utility connections. So installation costs are much lower than those of central heating systems. Lower equipment cost . . . lower installation cost . . . two reasons why Reznor gas unit heaters can offer substantial savings on heating systems for so many commercial and industrial buildings.

SAVE SPACE

Reznor gas unit heaters are installed up at the ceiling, completely out of the way. When you design for a store or factory, you don't have to allot a single square foot of valuable space for heating equipment . . . and you don't have to keep floor or wall areas clear for radiators or registers.

INSURE FLEXIBILITY

When you specify Reznor gas unit heaters you don't have to choose between a heating plant which is over-sized and over-priced for current requirements and one which may not be adequate for future needs. With Reznor unit heating, when that new wing is added, additional heaters are installed. It's as simple as that. And in the case of internal remodeling, it's very easy and inexpensive to relocate the existing heaters.

ONLY REZNOR GAS UNIT HEATERS OFFER ALL THESE ADVANTAGES

- Clean, modern design, back as well as front . . . all controls and connections inside the cabinet.
- FlexiTemp control system with automatic two-speed fan control to provide nearly continuous air circulation and minimize temperature fluctuations (optional).
- No costly frills and gadgets . . . features which are needed only to meet special situations always separately listed and priced.
- Fan or blower models in ten sizes from 25 to 300 thousand BTU.

There is no "equivalent" for Reznor gas unit heaters.

REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED UNIT HEATERS
Reznor Manufacturing Company
64 Union St., Mercer, Pennsylvania

for complete details, wherever you are . . .

Look for Reznor under "Heaters-Unit" in the Yellow Pages

NEW CATALOGS

(Continued from page 126)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

OUTLET CONNECTIONS — W-S Fittings Div., H. K. Porter Co., Inc., Roselle, N. J., has announced the availability of a 4-page bulletin describing its complete line of Couplets, strong, easy-to-install branch connections for tanks, pressure vessels and pipelines. Bulletin CP-1-57 includes complete dimensional and specification data on the screw-end and socket-welding connections, and on the 90 deg elbow fitting.

Circle **Item 111** on Inquiry Card

FRACTIONAL HORSEPOWER MOTORS —Bulletin GEA-6424 in 16 pages, full-color, illustrates design advantages and shows components in integrated insulation system of general purpose fractional horsepower motors manufactured by General Electric Co., Schenectady, N. Y. Motors are for use in the equipment manufacturing field on such applications as power tools, heating and ventilating equipment, compressors, fans, water pumps, and machine tools.

Circle **Item 112** on Inquiry Card

FUME HOODS — Kewaunee Mfg. Co., Adrian, Mich., has published a 49-page catalog devoted exclusively to fume hoods. Profusely illustrated with installation photographs, product pictures, elevation and roughing-in drawings, it includes engineering data and recommendations, operating characteristics, and operating cost comparisons. It covers every size and type of the company's fume hoods.

Circle **Item 113** on Inquiry Card

DOORLESS ENTRANCES — Available from American Air Curtain Corp., St. Louis, Mo., is a bulletin on the company's Air Curtain system for doorless building entrances. Literature illustrates and describes operation of the system as well as many commercial and operational advantages of open entrances.

Circle **Item 114** on Inquiry Card

GRILLES AND REGISTERS—Architects, air conditioning engineers, contractors and consulting engineers will be interested in the 66-page catalog (No. 1-57) which describes and illustrates the complete line of grilles and registers manufactured by Waterloo Register Co., Inc., Waterloo, Iowa. In addition to 32 photographs and 21 drawings, the catalog contains selection tables for each of the 26 standard sizes.

Circle **Item 115** on Inquiry Card

EXTRA-STRENGTH CLAY PIPE — A four-page bulletin, Extra-Strength Clay Pipe, another in a series of technical bulletins, has been prepared by the Clay Sewer Pipe Association, Inc., Columbus, Ohio. The bulletin illustrates pipe trenching conditions which require extra-strength pipe, and contains detailed tables of safe supporting strengths for both extra-strength and standard strength clay pipe. The tables give supporting strengths in pounds for lineal foot for pipe sizes from 6 to 36 inches and for varying bedding conditions. The bulletin also lists crushing strength requirements for extra-strength clay pipe and schedules of dimensions for full-diameter and reduced-diameter extra-strength pipe.

Circle **Item 116** on Inquiry Card

STEEL TUBING TOLERANCES — Peter A. Frasse & Co., Inc., New York, N. Y., distributor of tubular products, has published a data chart, designated Sec. B, No. 1, which fully explains tolerances for steel tubing and pipe. Covered on one convenient chart are tolerances for both seamless and welded mechanical tubing, and seamless and welded stainless steel tubing and pipe. The chart clearly and comprehensively explains each tolerance in detail and gives the permissible variations in OD, ID, wall, ovality, and straightness.

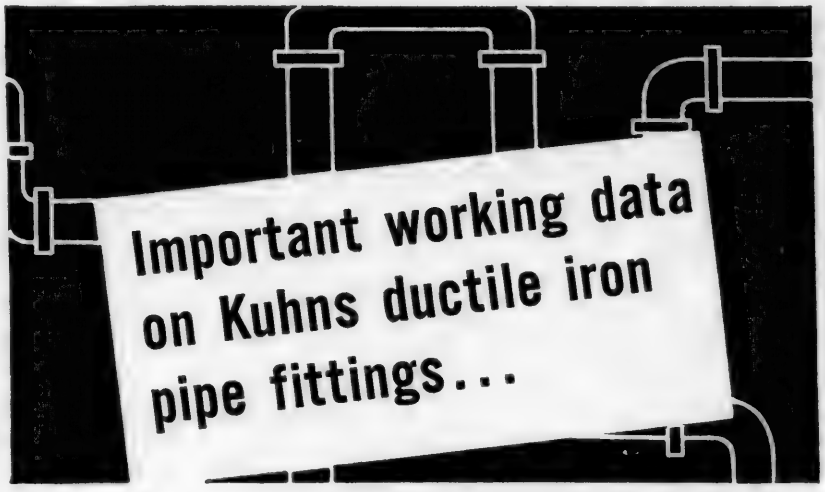
Circle **Item 117** on Inquiry Card

ONE-PIECE PIPE INSULATION — Complete specifications for Mono-Kover, a slit, one-piece, sectional type molded mineral wool pipe insulation that snaps into place, are presented in a three-color bulletin published by the Baldwin-Hill Company, Trenton, N. J. In addition to describing completely the insulating properties of the material, the pamphlet explains and illustrates approved application methods. Thermal conductivity is shown graphically for every temperature throughout operating range (to 350 deg F).

Circle **Item 118** on Inquiry Card

EDUCATIONAL PRESENTATION SERIES —Sporlan Valve Company announces a new educational and training presentation using audio-visual equipment available on loan at no charge. It will be available to technical societies; trade or technical schools; manufacturers' training, engineering, or service departments; installation and service companies; or any other interested groups. The first subject is titled The TEV Story—Theory of Operation, and covers the fundamental of the thermostatic expansion valve. It utilizes a 78-frame strip film in color synchronized to a microgroove record. Running time is 45 minutes. Requests for the training kit may be made through any Sporlan Field Engineer or direct to either Sporlan Valve Company, 7525 Sussex Avenue, St. Louis, Mo., or 22 West First Street, Mt. Vernon, N. Y.

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.



"K" Pipe Lock Couplings

Listed for 800 psi working pressure by Underwriters' Laboratories, Inc., "K" couplings have a safety factor of five times the UL listing for 2½" through 6" and four times the UL listing for 8". Sizes: 2½" through 8". Look for the "800 D" on each.

"K" Flanges and Flanged Fittings

Elbows, base elbows, 45° elbows, side outlet elbows, tees, side outlet tees, and reducers in straight and reducing sizes. Pressure rating, 500 psi by Underwriters' Laboratories, Inc. Flat faced flanges shipped as standard. Extra heavy flange dimensions and raised faces available on request. Look for the "DI 500" on each.

"K" Screwed Fittings

Pressure ratings listed by Underwriters' Laboratories, Inc.

STEAM AND OIL AT 550°F
¼" to 3".....300 lbs.

LIQUID AND GAS AT 150°F
¼" to 1".....2000 lbs.
1¼" to 2".....1500 lbs.
2½" to 3".....1000 lbs.

Note: These fittings are excellent for liquefied petroleum gas systems. Look for the "D 300" on each.

WHEN TO USE: Where structural strength and thermal shock resistance are specified. When high pressure sealing is vital to reduce hazards such as fire and explosion. To prevent leakage due to wide temperature changes, vibration and misalignment. Where rust and corrosion are problems. When fittings are to be reused. As Kuhns supplies cast, malleable and ductile iron fittings, these are impartial engineering recommendations.

Send for our catalog on ductile iron pipe fittings—the newest development in the industry. Available at better wholesalers.

THE KUHNS BROTHERS CO.
1800 McCALL STREET, DAYTON, OHIO

1887 • 70 Years of Continuous Progress • 1957

DRY AIR...
PRECISELY as you want it

NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

Write for full information; ask for Bulletins 112 and 121. Address Dept. HV-7.

NIAGARA BLOWER COMPANY
405 Lexington Ave., New York 17, N. Y.
District Engineers in Principal Cities of U.S. and Canada

mend it." Another declared that a word is what you make it, and that "hydronics would be perfectly acceptable," as proposed by the industry.

The new term encompasses all functions of water-controlled systems. Along with heating and cooling for the home, commercial buildings, and industrial structures, hydronics would serve to illustrate such operations as providing hot faucet water, melting of snow through coils embedded in driveways or sidewalks, zone temperature control, and countless other uses in which water, a flexible element, supplies the precise temperature, hot or cold, in order to perform instantaneously a number of functions.

Hydronics would also find application in describing the activities of people and operations within the industry, such as an hydronic engineer, hydronics manufacturer, hydronics wholesaler, contractor or dealer.

GENERATOR COOLING WATER

will heat hydroelectric powerhouse at Dallas Dam in Oregon. Year's trial at sister dam a success.

A heat pump installation using Columbia River generator cooling water as a heat source will provide year around air conditioning for the hydroelectric powerhouse at the new Dalles Dam in Oregon. Selection of the heat pump for the application, according to U. S. Army Engineer authorities, was based on successful results achieved by a sister installation, the first of its type, in operation for over a year at McNary Dam near Umatilla, about 200 miles above Portland and 130 miles from The Dalles.

• **POWERHOUSE TWO-FIFTHS MILE LONG—** Scheduled for completion in 1960, the Dalles Dam project will cost an estimated $260,000,000. It will be 8700 feet long, 280 feet high, and back water up 31 miles. The powerhouse alone will be two-fifths of a mile in length.

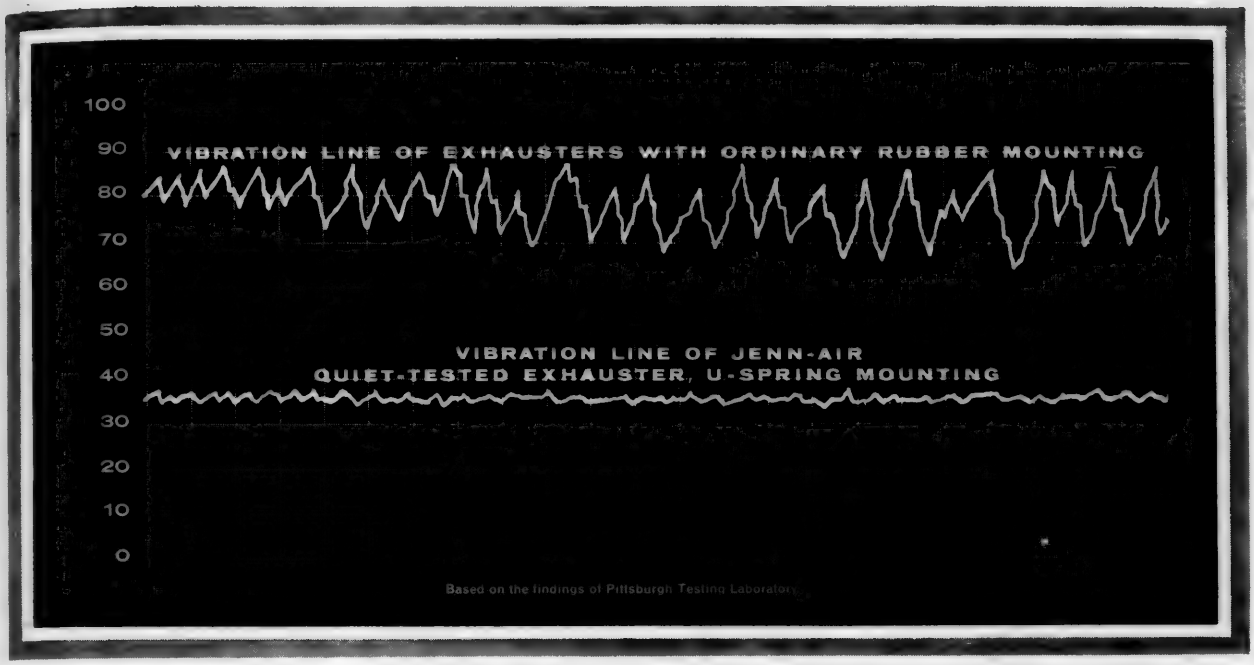
Principal components for the heat pump system will be three 150 horsepower CenTraVac hermetic centrifugal refrigeration units manufactured by The Trane Company, La Crosse, Wis. Approximately 500 tons of refrigeration or 144 million Btu's of heat in a 24-hour period will be provided by the system at full capacity.

Design temperature for the generator room at the dam is 50 deg F, and 70 deg for the remainder of the powerhouse.

Initial start-up of the heat pump system is manual, with the operator determining the number of hermetic centrifugals to be run at a given time. The operator will vary the machines running to equalize total hours of operation for each. Once operating, an outside anticipator control will automatically shut down the units when no heating or cooling is necessary, and start them up again when conditioning is required.

On the heating cycle, river water will be used first to cool 14 gigantic generators at the dam. In doing so, the water will pick up heat caused by friction, windage, and electrical losses. The 66-deg water will then be sent to

(Continued on page 132)



The above chart shows a comparison of vibration levels between ordinary exhausters and Jenn-Air Quiet-Tested Exhausters.

44% Less Vibration with JENN-AIR Quiet-tested Roof Exhausters!

Independent Laboratory Tests Prove Conclusively That Jenn-Air Quiet-Tested Roof Exhausters With U-Spring Suspension Show 44% Better Vibration Isolation Than Exhausters With Power Assembly Mounted in Rubber

Noise elimination is a problem which faces the ventilation industry today. To minimize the noise caused by vibration, Jenn-Air developed the Quiet-Tested Roof Exhauster with U-Spring cushion suspension. Now an independent laboratory offers proof positive this new principle of suspending the power assembly with U-Springs does the job. The PITTSBURGH TESTING LABORATORY, an independent research firm, was recently asked to compare Jenn-Air's Quiet-Tested Roof Exhauster, with U-Spring Suspension Mounting, against exhausters with ordinary rubber isolators. Tests were conducted under actual working conditions. Result: (see chart for dramatic evidence): *Jenn-Air Exhausters showed 44% less vibration transmission than the other exhausters.*

Jenn-Air Quiet-Tested Roof Exhauster, with U-Spring Cushion Suspension Mounting. Note low contour design which complements modern architectural lines.

U-SPRING CUSHION SUSPENSION MOUNTING REDUCES VIBRATION . . . NOISE LEVEL

This innovation is another important improvement by Jenn-Air. It ensures against the major operating vibration and noise being transmitted through the duct work and into the building. The stainless steel also assures you the permanency of this quiet operation. Jenn-Air—and only Jenn-Air—Quiet-Tested Exhausters are proved under simulated field conditions. Each unit must pass rigid inspection by the critical *Vibronic Eye* . . . is 'screened' in Jenn-Air's Sound-Elec Test Chamber to detect noise and vibration.

Patents Pending

JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive • Indianapolis, Indiana

JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive
Indianapolis 7, Indiana ACHV

Gentlemen:
Please send me free catalog giving complete information on how Jenn-Air U-Spring Cushion Suspension Mounting cuts vibration, lowers noise level.

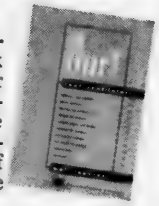
Name_____
Title_____
Company_____
Address_____
City_____ State_____

Burt

ROOF VENTILATORS
WALL LOUVERS

SEND FOR FREE DATA BOOK

BURT'S complete ventilator line includes a type and size to put air to work most efficiently and economically for your specialized needs. BURT'S engineering skill and know-how from more than half a century designing and building ventilators is your assurance of satisfaction. Your inquiry will receive prompt and qualified attention.



FAN & GRAVITY VENTILATORS LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St., Akron 11, Ohio

MEMBER POWER FAN MANUFACTURERS ASSOCIATION

the centrifugals where the heat will be removed and delivered to air handling units from the condensers at 105 deg.

• **COOLING CYCLE—** On the cooling cycle, river water is brought through the centrifugals, picks up the powerhouse heat, and is carried away.

Ventilation air for the air conditioning system will be supplied by two central fan, coil, and electrostatic filter systems. The building will be kept under a positive pressure by venting through dampered pressure relief vents.

WESTERN SHOW

reported a success. New association pleased at top attendance, well-attended technical sessions, displays.

Success of its first exhibit and conference program, the Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference, is reported by the newly-organized Western Air Conditioning Industries Association's President Arthur J. Hess.

Products of approximately 176 manufacturers were displayed and 7,286 persons registered during the May 4-8 show in Los Angeles' Shrine Exposition Hall. Two technical sessions held in conjunction with the conference, one on operating difficulties in refrigeration installations, and one on air conditioning in schools, were both well received and attended.

Exhibit Manager Fred J. Tabery announced that 85% of the exhibitors have indicated their desire for a continuation of this type of western exhibit. Plans for a 1958 show will be discussed shortly.

(Concluded on page 134)

Many previous commercial efforts in "tray agriculture", technically known as hydroponic farming, have failed because moisture-induced fungus killed otherwise healthy plantings. Louis A. Howsley, H & M Mfg. Co., Inc., Denton, Tex., is shown checking cereal grass progress in his company's Meadow-Master greenhouse. Carrier air conditioner, upper right, produces conditions enabling 72 trays arranged in 6 tiers to produce 12 baskets daily. Air is ducted to greenhouse to maintain 68-70 deg F, 70-90% humidity, recirculated every 80 sec. This type of farming may bring needed relief to drought-stricken Southwest.

ONE doesn't fit ALL needs!

Get *Airsan* Filters
ENGINEERED TO FIT THE JOB — RIGHT EVERY TIME

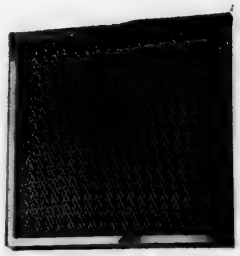
No filter does all jobs, meets every need. That's why Airsan Filters are engineered to the job to offer more effective dust collection. Airsan's expanded metal face plate acts as a lint arrestor to provide easier cleaning and servicing. It distributes air easily over the entire filter area. Provide high filtering efficiency and dust holding capacity with less resistance. Features include all galvanized construction and welded lock corners. Write for data.

Send for Free Bulletins

AFI MEMBER AIR FILTER INSTITUTE

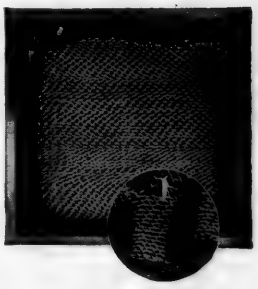
AIR FILTERS
(Low Velocity)

Viscous type, permanent and cleanable designed for industrial, commercial and domestic use. Available in 1" and 2" thickness.



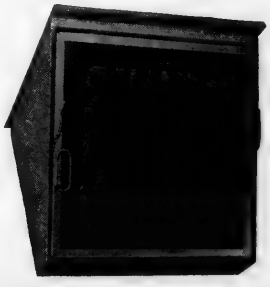
VIRO-CRIMP
(High Velocity)

Has a specially designed high velocity Viro-Crimp filter core. Hemmed edges provide a safety feature. Operates efficiently at 300 to 500 fpm. Available in 2" and 4" thickness.



GREASE FILTERS

Permanent, cleanable type Airsan Grease Filters made especially for range canopies, galleys, kitchens. Available in 2" thickness.



Air Filter Corporation

108H NORTH WATER ST. • MILWAUKEE 2, WIS.

Canadian Representative
DOUGLAS ENGINEERING CO., LTD., MONTREAL

A Few Distributorships Available. Write for Details!

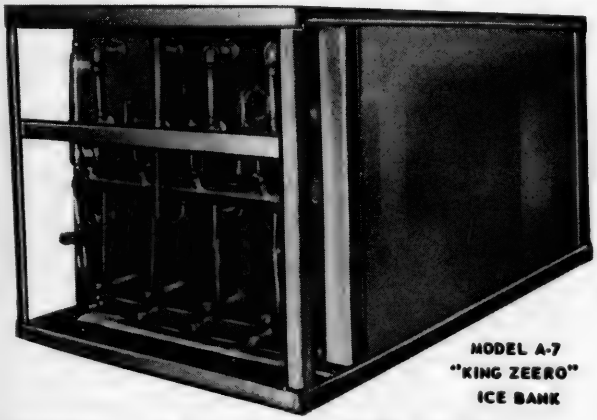
"King Zeero's" Sweet Water ICE BANKS offer ICE-CONCENTRATED Refrigeration for Air Conditioning

CONTINUOUS RIFLED GALVANIZED COILS
EXPANSION VALVE CONTROLLED

32°-34° COLD ICE WATER

DESIGNED FOR USE WITH:
FREON — METHYL CHLORIDE — AMMONIA

The "King Zeero" ICE BANK is designed for air cooling in Churches, Mortuaries, Theatres, Offices, Stores, Auditoriums, Factories, Clubs, Restaurants. etc. Ice Banks may be added to existing systems for increased capacity.



MODEL A-7
"KING ZEERO"
ICE BANK

CAPACITIES - 500 lbs. to 30,000 lbs. (72,000 B.T.U.'s to 4,320,000 B.T.U.'s) in a single unit. Multiple units may be installed.

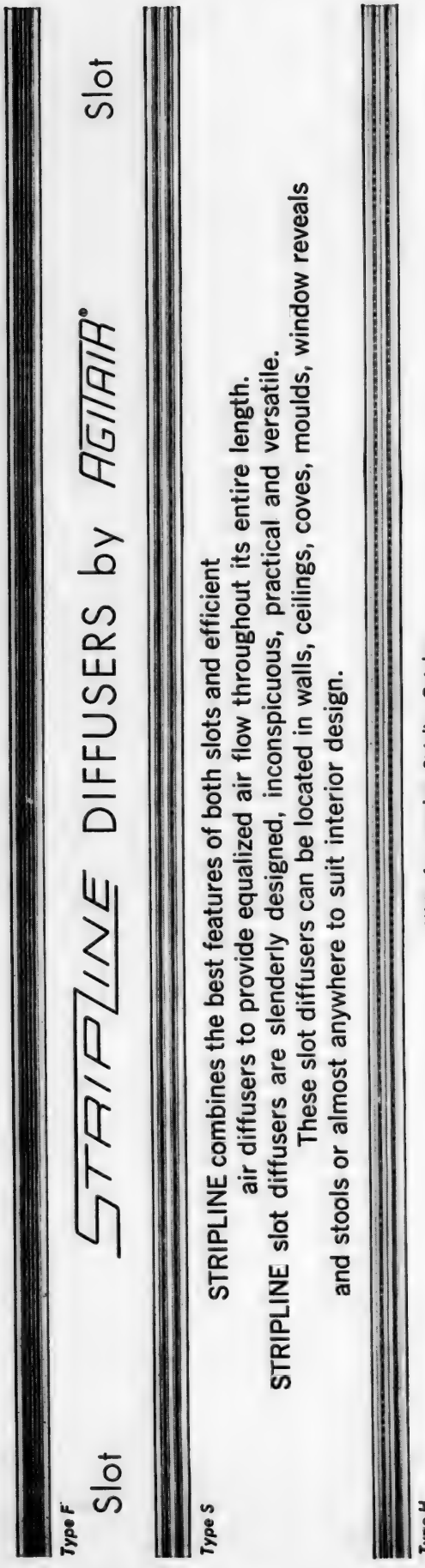
The "King Zeero" ICE BANK is designed to deliver tons of 32 to 34 F. ice water for recirculation through air cooling coils. Peak loads many times compressor capacity are easily handled.

- DIRECTED COURSE OF WATER travels with "built-in" agitation.
- NO MECHANICAL AGITATION REQUIRED.
- LARGE WATER COMPARTMENTS spaced on 11" and 12" centers.
- 33% EXTRA ICE CAPACITY safely attained without freezing up.
- ICE IS "BURNED OFF" PLATE COILS progressively, exposing prime and secondary surface for maximum flash cooling capacity.
- ICE THICKNESS automatically controlled - eliminates "freeze ups."
- 94 SIZES to fit space requirements. Other designs for special applications.

THE KING ZEERO COMPANY

4300-14 W. Montrose Ave. - Chicago 41, Ill.

Manufacturers of Ice Builders - Ice Builder Cabinets - Ice Banks


Slot
STRIPLINE DIFFUSERS by AGITAIR®
Slot
Type F
Type S
STRIPLINE combines the best features of both slots and efficient air diffusers to provide equalized air flow throughout its entire length.
STRIPLINE slot diffusers are slenderly designed, inconspicuous, practical and versatile. These slot diffusers can be located in walls, ceilings, coves, moulds, window reveals and stools or almost anywhere to suit interior design.
Type H
Write for complete Stripline Catalog.
AIR DEVICES INC. • 185 MADISON AVENUE • NEW YORK 16, N. Y. • AIR DIFFUSERS • FILTERS • EXHAUSTERS

SEEK STANDARD

on automatic controls terminology. ASME sponsors ASA committee headed by General Electric engineers.

Under the auspices of the American Standards Association, a project has been started to establish standard terms pertaining to automatic control, and to develop definitions of such terms. The increased use of automatic controls in manufacturing industries, in process industries, and in business administration has brought about a need for creating a common language for this field of engineering effort.

To handle this project, Sectional Committee C85 has been constituted under ASA procedure, and its organization has been approved by ASA as of April 5, 1955. Its title is "Terminology for Automatic Controls." Its sponsor is the American Society of Mechanical Engineers. Its scope is as follows: "Terminology pertaining to systems such as: automatic process control, feedback control, regulating and other related systems not requiring human intervention as part of the regulating procedure."

Committee officers are M. A. Princi, General Electric Co., Lynn, Mass., chairman, and G. W. Heumann, General Electric Co., Schenectady, N. Y., secretary.

• **TO COMPILE DICTIONARY**—C-85 will develop a dictionary of terms and definitions. A close relationship is being maintained with Sectional Committee Y-10, also under the auspices of ASA, which has been assigned the responsibility for letter symbols and graphical representations as used in automatic control systems.

A review of source material published in the United States brought to light over one hundred items of published standards, draft of standards, papers and articles dealing with terminology for automatic control systems.

• **REPORT NEAR**—A number of meetings of the main Committee and of its subcommittees have been held, and some 200 terms have been defined tentatively. It is anticipated that these definitions will be distributed for comments in the near future. The initial phase of the work of C-85 will probably be consummated during the current year. It is expected that C-85 will then proceed to cover additional work areas and go more deeply into the fields of specific control systems.

WHAT READERS SAY

Selection of Fan Types

EDITOR:

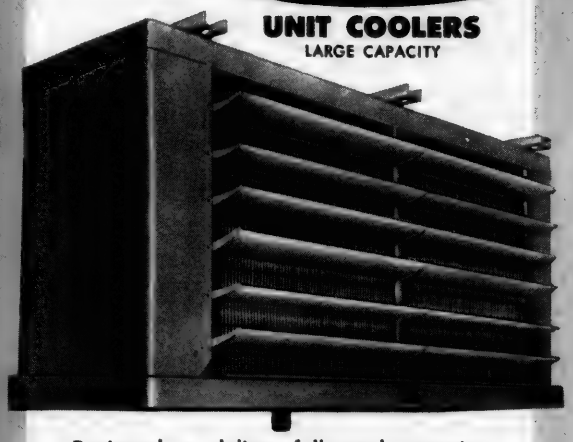
The article on "Selection of Fan Types" by A. N. Rogers in your May issue contains much basic fan information. However, it also contains one statement which may mislead some of your readers.

The article states, "It is a well known fact that the dip in the pressure curve is a serious drawback to parallel

(Concluded on page 136)

RIGIDBILT

UNIT COOLERS
LARGE CAPACITY



Designed to deliver full-rated capacity. They reduce number of units required. Eliminate extra piping and electrical connections. For operation at all normal temperatures. Efficient and economical.

RIGIDBILT INC.

2852 WEST FULTON BLVD., CHICAGO 12, ILL.

HEATING • AIR CONDITIONING • REFRIGERATION

Jetty SALUTES THESE FORWARD LOOKING REPRESENTATIVES OF

KOCH
JET forced draft
COOLING TOWER

H. E. Culley & Co.
414 West Main Street
Louisville, Kentucky

The Sales Engineers
6524 Walker Street
Minneapolis 26, Minn.

Leffler-Greene Supply Co.
1604 N. W. Fifth Street
Oklahoma City, Okla.

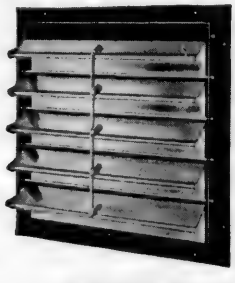
KOCH
ENGINEERING CO., INC.
321 West Douglas
Wichita, Kansas

* Write today for the name of the Koch Representative nearest you

Elgo Ventilating Specialties

The Favorite Automatic Shutter

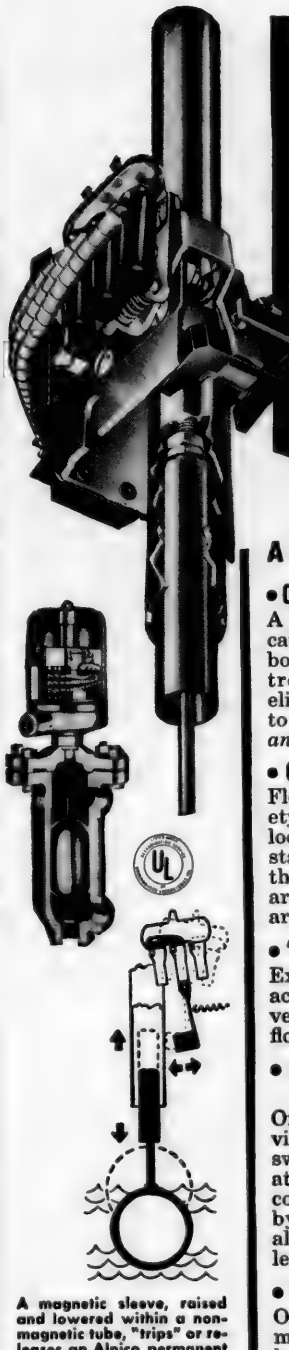
The Elgo Automatic Shutter is the favorite of many large users because of its outstanding features. Easier opening and tighter closing. Weather-stripped on all sides. No flapping or fluttering. Sizes 12" to 72" square—also rectangular.



"ELGO" TYPE AUTOMATIC SHUTTER
Front View (Open)

Free CATALOG

ELGO SHUTTER & MANUFACTURING CO.
2738 W. Warren Detroit 8, Mich.



A magnetic sleeve, raised and lowered within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

WHY you are SAFER with MAGNETROL BOILER WATER LEVEL CONTROL

A Few of MANY Reasons:

• Operating Life Is Practically Unlimited
A PERMANENT Alnico magnet, located *outside* the float chamber, links boiler water level and electrical controls. This simpler magnetic link eliminates mechanical parts subject to wear and fatigue failure. *Pioneered and perfected by Magnetrol.*

• Customized Corrosion Control
Floats can be fabricated from a variety of materials to meet any "special" local corrosion problems. Type 304 stainless steel floats have proven over the years to have the greatest all-around corrosion resistance, and so are furnished as standard.

• "No-Scale" Float Chamber Liner
Exclusive self-cleaning brass liner actually "flexes" off corrosion—prevents scale growth and "sticking" of float.

• Up to Three Switches— an Exclusive Safety Feature
Only MAGNETROL design can provide up to three completely separate switch mechanisims, each operating at its own level, in a STANDARD control. Use extra switch for "stand-by" pump for emergency use; or alarm BEFORE fuel cut-off; or high level alarm; etc.

• Least Maintenance
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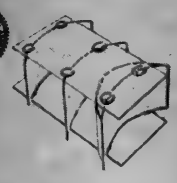

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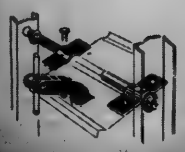

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(Concluded from page 134)

operation when fans are operating at peak efficiencies. When fans are individually motored, it is possible to have one fan carry more than its share of the load and the other fan much less. In unitary equipment, however, where two fans are running on a single shaft this problem is not serious."

Forward curve fans do have a greater tendency toward instability than do backward inclined fans. This is particularly true when forward curve fans are mounted in parallel, either as single width or double width fans, and when the inlet flow conditions are not identical for all fan inlets. However, when inlet flow conditions are identical, and fan selection is made so that the fan operates within the manufacturer's catalog range, there is no need to worry about unstable operation. Each fan will pull its share of the load whether they are run on a common shaft or are motored individually.

The NAFM test code requires that multiple fan units, such as the usual heating and ventilating unit, be tested for catalog ratings. This is nothing but an example of parallel fan operation with identical inlet flow conditions. If fans under these conditions were unstable it would be impossible for fan manufacturers to establish a fan performance curve. Such is not the case. These fans, usually forward curve, function as smoothly and with as much stability in this parallel application as they do as single fans.

C. J. Trickler

Chief Engineer,
The New York Blower Co.,
La Porte, Ind.

Canadian Degree-Days for May, 1957*

City	May 1957	May Normal**	Cumulative 1956-57	Cumulative Normal
Calgary, Alta.	395	460	9153	8970
Charlottetown, P.E.I.	583	560	8445	8330
Crescent Valley, B. C.	233	400	7849	7610
Edmonton, Alta.	338	410	9522	9830
Fort William, Ont.	519	540	10223	10180
Grande Prairie, Alta.	433	460	10341	10390
Halifax, N. S.	492	484	7024	7246
London, Ont.	362	330	7051	7230
Medicine Hat, Alta.	207	320	7444	8450
Moncton, N. B.	484	480	8609	8500
Montreal, P. Q.	326	270	8003	8240
North Bay, Ont.	496	470	8744	9520
Ottawa, Ont.	347	330	8211	8580
Penticton, B. C.	139	260	6745	6270
Prince George, B. C.	332	480	9732	8980
Quebec City, P. Q.	414	430	8022	9240
Regina, Sask.	310	420	10383	10400
St. John, N. B.	503	510	8311	8380
Saskatoon, Sask.	337	420	10489	10610
Timmins, Ont.	547	550	10556	11060
Toronto, Ont.	334	316	6480	6898
Vancouver, B. C.	215	320	5517	5230
Victoria, B. C.	332	315	5452	4870
Windsor, Ont.	300	270	6341	6560
Winnipeg, Man.	311	411	10287	10399

* These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.

** New normal figures covering 30-year period, 1921 to 1950.

The Department reports a slight revision in the figures for April, as published in last month's issue. Corrected figures are: Grande Prairie, Alta., 776; Prince George, B. C., 741; St. John, N. B., 805; Victoria, B. C., 501.

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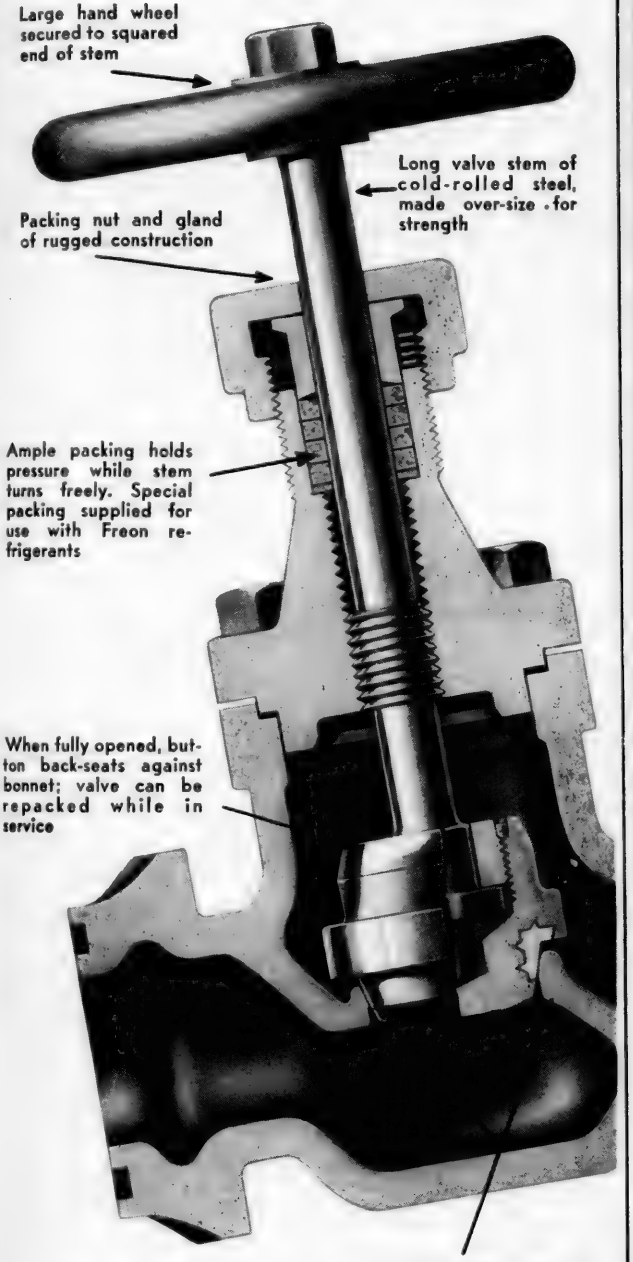
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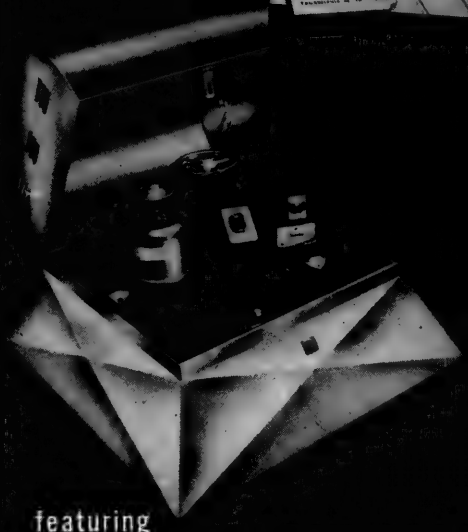

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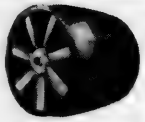

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COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

APPLIED HEAT TRANSFER CONFERENCE—First National Conference on Applied Heat Transfer, sponsored by the heat transfer division and central Pennsylvania section of the American Society of Mechanical Engineers, in cooperation with the College of Engineering and Architecture of the University, to be held at Pennsylvania State University, University Park, Pa. Secretary of the ASME, 29 W. 39th St., New York 18, N. Y. ..... **AUGUST 11-15, 1957.**

CRYOGENIC ENGINEERING CONFERENCE—1957 Cryogenic Engineering Conference at the National Bureau of Standards, Boulder, Colo. K. D. Timmerhaus, secretary, Cryogenic Engineering Conference Committee, Department of Chemical Engineering, University of Colorado, Boulder, Colo. ..... **AUGUST 19-21, 1957.**

AUTOMATION CONFERENCE AND EXHIBIT—12th Annual Instrument Automation Conference and Exhibit, sponsored by the Instrument Society of America, Pittsburgh, Pa., to be held at Cleveland Auditorium, Cleveland, Ohio. Secretary of the Society, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **SEPTEMBER 9-13, 1957.**

AGA CONFERENCE—Annual Accident Prevention Conference of the American Gas Association, at the Sheraton-Jefferson Hotel, St. Louis, Mo. Secretary of the Association, 420 Lexington Ave., New York, N. Y. ..... **SEPTEMBER 16-18, 1957.**

AGA MEETING—Annual convention, American Gas Association, Kiel Auditorium, St. Louis, Mo. AGA, 420 Lexington Ave., New York, N. Y. ..... **OCTOBER 7-9, 1957.**

NATIONAL SAFETY COUNCIL EXPOSITION—45th National Safety Congress & Exposition, to be held in Chicago, Ill. Headquarters not yet announced. Secretary of the National Safety Council, 425 N. Michigan Ave., Chicago, Ill. ..... **OCTOBER 21-25, 1957.**

AIR POLLUTION CONFERENCE—Air Pollution Conference, to be held in Chicago, Ill. Headquarters not yet announced. Co-sponsored by Armour Research Foundation and the Midwestern Air Pollution Prevention Association. Conference secretary of Armour Research, 10 W. 35th St., Chicago 16, Ill. ..... **NOVEMBER 13-14, 1957.**

ASRE MEETING—Semi-annual meeting of the American Society of Refrigerating Engineers, at the Hotel Shoreland, Chicago, Ill. Secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **NOVEMBER 14-16, 1957.**

WHOLESALERS—Annual meeting, Air Conditioning and Refrigeration Wholesalers, Sheraton Hotel, Chicago, Ill. Secretary, 2607 N. High St., Columbus, Ohio. ..... **NOVEMBER 16-18, 1957.**

AIR-CONDITIONING AND REFRIGERATION EXPOSITION — 10th exposition of the Air-Conditioning and Refrigeration industry, sponsored by the Air-Conditioning and Refrigeration Institute, at Chicago's International Amphitheatre, Chicago, Ill. Secretary of the Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 18-21, 1957.**

WARM AIR HEATING—Annual convention, National Warm Air Heating and Air Conditioning Association, Hotel Morrison, Chicago, Ill. George Boedener, Secretary, NWAHACA, 640 Engineers Bldg., Cleveland, Ohio ..... **NOVEMBER 18-22, 1957.**

ASME MEETING—Annual meeting of the American Society of Mechanical Engineers, at the Hotel Statler, New York, N. Y. Secretary of the Society, 29 W. 39th St., New York, N. Y. ..... **DECEMBER 1-6, 1957.**

ASHAE WINTER MEETING — 64th annual meeting, American Society of Heating and Air-Conditioning Engineers, Pittsburgh, Pa. A. V. Hutchinson, secretary ASHAE, 62 Worth St., New York, N. Y. ..... **JANUARY 27-29, 1958.**

JOINT ASHAE-ASRE MEETING—Joint summer meeting, American Society Heating and Air-Conditioning Engineers and American Society Refrigerating Engineers, Hotel Leamington, Minneapolis, Minn. ..... **JUNE 23-25, 1958.**

EXPOSITION AND ASHAE CONVENTION—65th annual meeting, American Society Heating and Air-Conditioning Engineers (Jan. 26-29, 1959) and 14th International Heating and Air Conditioning Exposition, Philadelphia, Pa. ..... **JANUARY 26-30, 1959.**

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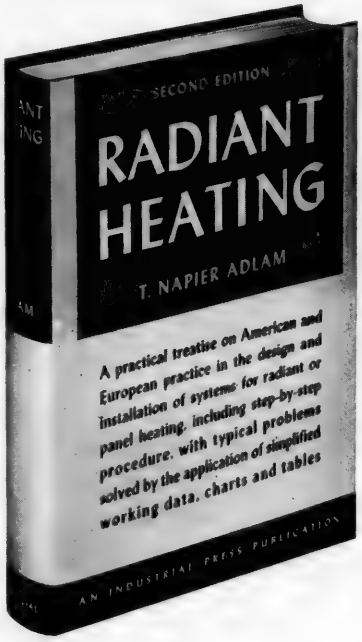
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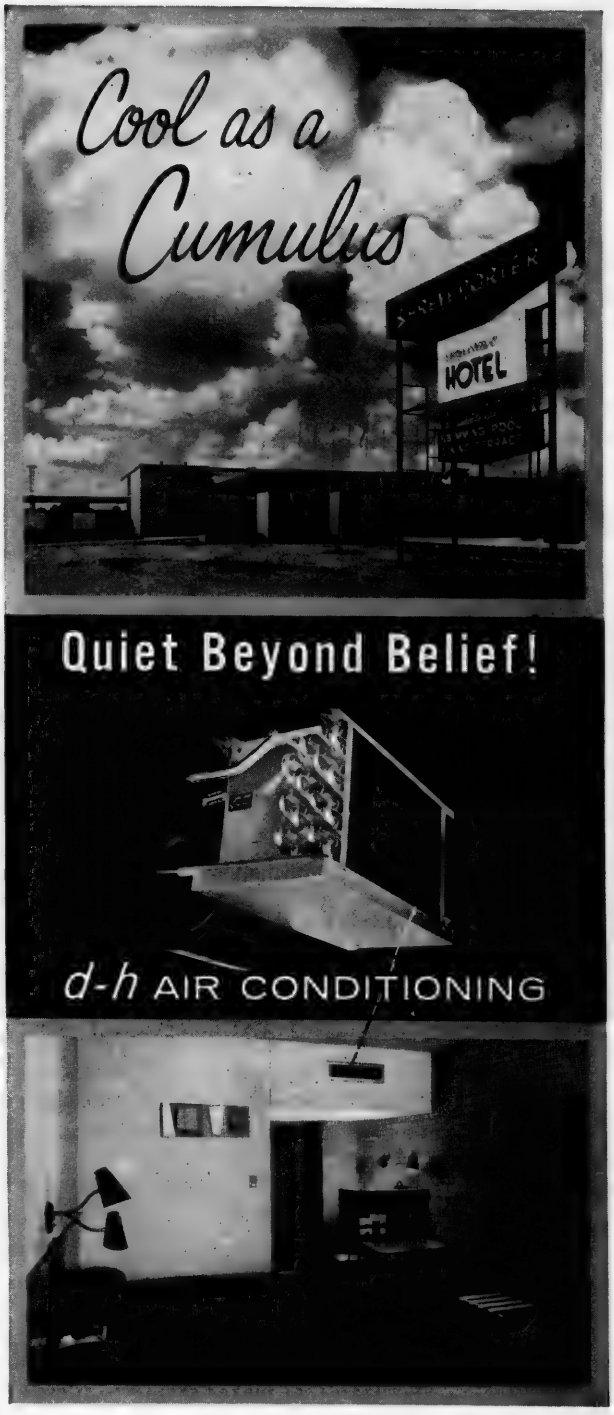

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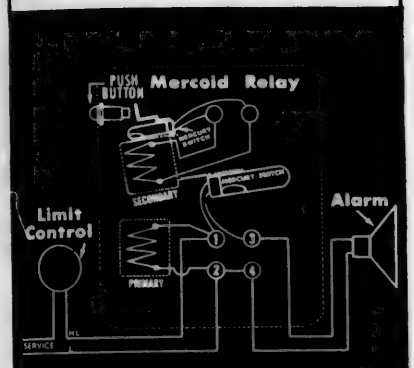

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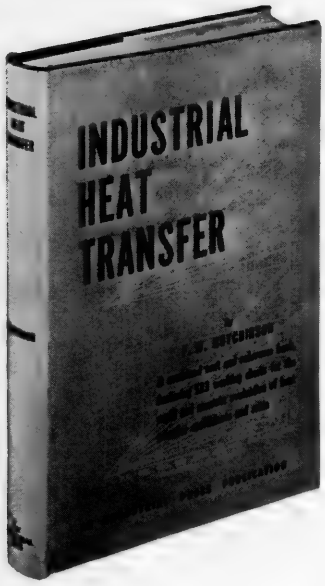

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(Continued on page 144)

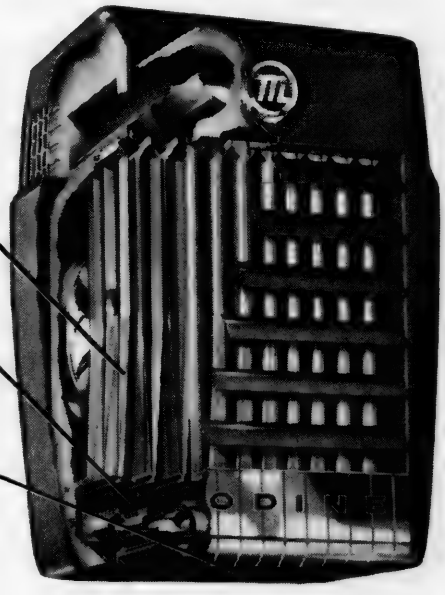
Magnificent

any way you look at it!

Modine Gas Unit Heaters are years ahead in styling

Here's superb styling, sturdy construction, unbeatable performance. Stainless steel burners and stainless or aluminized steel heat exchangers and direct-fired tubes assure quick heat . . . long-lasting, economical service. And Modines are up to 50% lighter, cost less to ship and install. Eight sizes are available from 25,000 to 310,000 Btu. For natural, mixed, LP and LP-air gas mixtures.

Modine is years ahead in long-life efficiency



FAST, UNIFORM HEAT

Direct-firing of each heat exchanger tube assures quick, uniform heat distribution.

TROUBLE-FREE OPERATION

Large, knife-sharp stainless steel ports resist lodging of dirt and scale.

IMPROVED COMBUSTION

Hooded combustion air inlets below each burner tube improve efficiency . . . minimize flame disturbance.

Complete details are contained in Bulletin 656-A. Get your copy by calling the Modine representative listed in your classified phone book or use the handy coupon.

Modine
MANUFACTURING COMPANY

MODINE MFG. CO
1511 DeKoven Ave., Racine, Wis.

Send me free copy of Bulletin 656-A.

Name.....
Firm.....
Address.....
City.....Zone....State.....

GU-1345

At the new Caterpillar Tractor plant in Decatur, Illinois, four Binks 2-K Series cooling towers play important roles in the manufacturing processes.

at Caterpillar's Decatur plant

Binks towers keep heat treating under cool control

The tough muscles of steel that make "Cat" motor graders and wheel tractors dependable work horses are no accident. All vital parts go through scientifically controlled heat treat processes.

Binks cooling towers play an important part in this process by controlling the temperature of quenching oils and water. They are also used to cool water that circulates to cool bearings in the electric induction heat treat furnaces.

Failure of the cooling equipment could be costly.

Dependability you can count on

Binks cooling towers are built to rigid specifications. All panels and framework are heavily galvanized and coated for long life and minimum maintenance. Fans are corrosion-resistant aluminum alloy. Scientifically balanced air-to-water ratios give high cooling efficiency under all climatic conditions.

A complete line

Whether it is for cooling process fluids or for use with air conditioning compressors, there's a Binks cooling tower, of the correct capacity and type for every job.

Send for complete data

Ask your Binks branch office for a copy of Bulletin 333 and Bulletin 477-A or write direct to the address below. Binks engineers will be glad to answer your questions and help you solve your cooling problems. There's no obligation.

685

Binks

EVERYTHING FOR WATER COOLING

Visit us in BOOTH 1172

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company

3120-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

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AIR CONDITIONING, HEATING and VENTILATING **Ad-Digest**

AND PRODUCT INFORMATION SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

SAFETY VALVES AND CONTROLS
Described in this ad is the manufacturer's quality line of safety valves and controls for hot water supply and heating systems. Condensed catalog is available.
Inside Front Cover — Item 200

BONDED FAN RATINGS
Manufacturer's fan ratings are dependable to the extent that they are now bonded as to performance by the American Surety Company. Information is available.
Page 1 — Item 201

LARGE UNIT HEATER
Manufacturer's giant size unit heater provides uniform, economical heating and ventilating for factories, warehouses, hangars and machine shops. Bulletin is available.
Page 2 — Item 202

DATA FILE ON STORAGE HEATERS
Containing all basic data on company's copperlined storage water heaters, file contains complete specification outline, construction details, heating capacities, engineering and installation data, and many other needed facts.
Page 5 — Item 203

MULTIPLE SHEET INSULATION
For summer comfort the U.S. National Bureau of Standards rates multiple layers of aluminum first among all insulations tested. Report in booklet form is available.
Page 7 — Item 204

WROUGHT IRON PIPE
Radiant heating system serving 22,500 sq ft of floor area in Pacific Telephone & Telegraph Company's new warehouse at San Leandro, Calif., is illustrated, showing application of this company's wrought iron pipe. The system is safeguarded against premature failure and costly repair. Bulletin available.
Page 9 — Item 205

FLUSH VALVES
For buildings with a future such as the Peachtree-Baker building in Atlanta, Georgia, careful, long range planning calls for the manufacturer's flush valves. Catalog is availble.
Page 11 — Item 206

HEAT-EXCHANGE INFORMATION
There is a competent heat transfer engineer from this company nearby, qualified by training and long experience to find the right answer to any heat exchange problem, Information is available.
Page 13 — Item 207

SHOWER MIXING VALVE
Available from this manufacturer is the industry's first completely recessed thermostatic shower mixing valve. Device provides greater showering comfort in complete safety. Information is available.
Page 16 — Item 208

LINE OF REFRIGERANTS
The manufacturer's line of color-coded super-dry refrigerants are tops in quality and performance. Information is available.
Page 17 — Item 209

CENTRIFUGAL ROOF VENTILATOR
Manufacturer's centrifugal roof ventilator is developed and manufactured with applied centrifugal blower principles. Machines feature quietness, adaptability, efficiency and sturdiness. Bulletin is available.
Page 18 — Item 210

PIPE AND TUBING
Manufacturer states that when you buy American quality tubing and pipe your dollars build new American projects and new markets for you. Information is available.
Page 19 — Item 211

PRESSURE REGULATORS
The manufacturer's bronze pressure regulators offer dependable precision control of steam and air pressure. They are available in sizes ¼ to 2 inches. Circular on regulator selection is available.
Page 20 — Item 212

PACKAGED COOLING TOWERS
These packaged double flow cooling towers are re-designed for greater utility, increased durability and reduced installation cost. Cost-wise and performance-wise they are tops in the 80 to 125 ton field. Information is available.
Page 21 — Item 213

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information.

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PLEASE PRINT July H-57

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Street .....

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This card is void after Oct. 1, 1957

Ad-Digest

DIRECT-FIRED HEATERS
All parts of the company's direct fired space heaters combine to fulfill a new concept in the burning of fuel. Units are adaptable as space heaters, duct type furnaces and process driers. Bulletin is available.
Page 22-23 Item 214

SEAMLESS PIPE
Approximately 470 tons of the company's seamless pipe were used in the construction of the air conditioning and heating systems for the Socony-Mobil Building in New York City. 350 tons were used in the building's plumbing system. Information on pipe applications is available.
Page 26 Item 215

POWER ROOF VENTILATORS
For exhausting or ventilating large areas where duct work may not be desirable, these power roof ventilators are easy to install and offer rugged, maintenance free operation. Bulletin is available.
Page 27 Item 216

BASEBOARD HEATER
Trim, new style of baseboard heater from the company provides custom styling with attractive models. Available in a wide variety of styles to suit any building plan. Information is available.
Page 28-29 Item 217

GLASS FIBER INSULATION
The company's flexible glass fiber insulation is used by Airtemp Division of Chrysler Corporation for air conditioning and heating units to prevent condensation or heat transfer at metal cabinet walls. Information is available.
Page 30 Item 218

BAROMETRIC DRAFT CONTROLS
When a draft inducer is used to assist a faulty chimney or to permit modern low stack construction a barometric draft control should also be installed. Technical data are available.
Page 31 Item 219

GALVANIZED SHEETS
Even 85 mph slam of a polo ball fails to crack or flake the zinc coating on these galvanized sheets available in pages 8 to 30. Booklet is available.
Page 32-33 Item 220

CAST IRON BOILER
Fuel economy is high on the list of features for the manufacturer's gas fired cast iron boiler. Additional features are an easy-fit header and electronic control panel. Information is available.
Page 34 Item 221

FUEL OIL PRE-HEATER
Number one in a series of idea sheets from this company describes use of secondary steam to pre-heat heavy fuel oil in a high temperature hot system. Additional data is available.
Page 35 Item 222

AIR COOLED CONDENSERS
As engineers plan larger tonnage installations, more of this company's remote type air cooled condensers that require no water are sold. They can be used with any size compressor regardless of horsepower. Requires less horsepower, less piping and is easier to install. Bulletin available.
Page 36 Item 223

ZINC-COATED SHEETS
The manufacturer's zinc-coated galvanized sheets are claimed to have the tightest zinc coating yet produced. Finished ducts look good and provide long service. Information is available.
Page 37 Item 224

FRACTIONAL HOREPOWER MOTORS
Savings in space and weight are among the many advantages of using the company's capacitor-start or split-phase fractional horsepower motors in your equipment. Bulletin is available.
Page 38 Item 225

EVAPORATOR UNITS
Vertical and horizontal furnace bonnet evaporator units for residential air conditioning feature unique condensate eliminators. Catalog is available.
Page 39 Item 226

CENTRIFUGAL REFRIGERATION MACHINES
Two 300-ton machines are the heart of new air conditioning system in New Orleans Federal Office Building. Contractor selected them because they were the most flexible, easy to install, and exceeded government specifications. Information available.
Page 40 Item 227

LINE OF PUMPS
There is no need for a custom job of pump application since a standard type pump from this manufacturer will meet any exacting requirements. Information is available.
Page 41 Item 228

HEATING EQUIPMENT
Manufacturer's concept of one source-one responsibility for heating equipment was accepted by designers and contractors for new children's hospital in St. Louis, Mo. Information is available.
Page 42 Item 229

EXPANSION JOINT
The manufacturer's expansion joint has an improved one-piece design of body and gland and an improved method of packing which provide new maintenance economies and greater operating efficiency. Bulletin is available.
Page 43 Item 230

AIR CONDITIONING EQUIPMENT
The $26-million Elmhurst General Hospital in New York City employed 107 of the manufacturers air conditioning units as well as large fans and unit ventilating sets. Information is available.
Page 44 Item 231

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BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE

Ad-Digest

GATE, GLOBE AND CHECK VALVES
In the new House of Seagram in New York City the manufacturer's gate, globe and check valves are used exclusively. Information on complete valve line is available.
Page 45 Item 232

MODERN COAL BURNER
A fuel cost survey proves coal best for the Poinsett Hotel in Greenville, S. C. Additional case histories on modern coal burner are available.
Page 46 Item 233

STEEL PIPE
Architects specified this company's steel pipe for attractive service building, parts of which are under construction on the campus of Cleveland's John Carroll University. Information available.
Page 48 Item 234

HEATING SPECIALTIES
Undivided responsibility is offered for complete lines of heating specialties, finned tube and baseboard radiation, and weather-compensated control systems. Information is available.
Page 49 Item 235

VACUUM HEATING PUMP
This new vacuum heating pump has the increased air capacity efficient heating practice demands. Pump features low return line connection. Information is available.
Page 52 Item 236

COPPER WATER TUBE
Builder, contractor, architect and engineer all agree that there is no "or equal" when it comes to copper water tube for hot and cold water lines, radiant panel heating, air conditioning lines and underground service lines. Information is available.
Page 111 Item 237

THERMOSTATIC RADIATOR TRAPS
Thermostatic bellows for the company's radiator traps are expanded and contracted fifty million times or more to test and study their fatigue resistance. Bulletin is available.
Page 113 Item 238

STEEL PIPE
Steel pipe is recommended for remodeling jobs because of its soundness and dependability. It saves time, too, due to ease of cutting, threading and welding. Information is available.
Page 115 Item 239

AIR COOLED CONDENSER
Now you can buy an air cooled condenser with lifetime high capacity, company's engineers say. Their turbo-flow finned coils won't clog. Condenser bulletin available.
Page 119 Item 240

TWO-STAGE OIL BURNER
A two-stage atomizing principle reduces any grade of fuel oil through No. 5 to a microscopic mist easily ignited by an electric spark. Information is available.
Page 121 Item 241

FLEXIBLE HOSE
Extremely flexible, durable and light weight, this flexible hose is adaptable for all kinds of fume and dust control and ventilation uses. Information is available.
Page 122 Item 242

CONCRETE FASTENER
No expensive masonry drills or explosive charges are needed since every concrete fastener is its own drill. It may be installed by hand or impact hammer. Catalog and free sample is available.
Page 123 Item 243

POWER ROOF EXHAUSTERS
Sleek, low roof hugging designs provide a contemporary contour for this efficient power roof exhauster line. Bulletin is available.
Page 124 Item 244

MOTOR PUMPS
Utilization of this company's motor pumps in an air conditioning system is a good sales point because they will recognize the brand name. Pumps vary in sizes from ¼ to 75 hp. Literature is available.
Page 125 Item 245

VIBRATION INSULATORS
Machinery installations can be made anywhere in a building without fear of annoyances through use of the manufacturer's mounts for vibration and noise control. Bulletin is available.
Page 126 Item 246

UNIT HEATERS
The cost of these unit heaters is comparable to or lower than that of other types of equipment of equal heating capacity, and this is the total cost. Information is available.
Page 128 Item 247

PIPE FITTINGS
Manufacturer's line of ductile iron pipe fittings are designed for application where structural strength and thermal shock resistance are specified and also where rust and corrosion are problems. Catalog is available.
Page 129 Item 248

HUMIDITY CONTROL
The manufacturer's method of humidity control provides more effective air conditioning because cooling and heating functions are made separate from adding or taking away of moisture. Two bulletins which describe system are available.
Page 130 Item 249

QUIET ROOF EXHAUSTERS
To minimize noise caused by vibration, the company developed this quiet-tested roof exhauster with its special cushion suspension. Forty-four per cent less vibration is transmitted. Catalog is available.
Page 131 Item 250

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

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Street .....

City .....**Zone** ....**State** .....

This card is void after Oct. 1, 1957

Ad-Digest

VENTILATOR LINE
The manufacturer's complete ventilator line includes a type and size to put air to work most efficiently and economically for any specialized needs. Data book is available.
Page 132 Item 251

ICE BANKS
Sweet water ice banks are designed by this manufacturer to deliver tons of 32 to 34-deg F ice water for recirculation through air cooling coils in air conditioning systems. Designed for use with Freon, methyl chloride, or ammonia, the banks may be added to existing systems for increased capacity. Information is available.
Page 133 Item 252

AIR FILTERS
The line of air filters offered by this manufacturer includes: a viscous type, permanent and cleanable for low velocity systems; one that operates at 300 to 500 fpm; and a permanent, cleanable grease filter for range canopies and kitchens. Bulletins are available.
Page 133 Item 253

STRIP AIR DIFFUSERS
The strip air diffusers made by this company combine the features of both slots and air diffusers to provide equalized air flow throughout the entire length. The slot diffusers can be located in walls, ceilings, coves, moulds, window reveals, and stools. Catalog is available.
Page 134 Item 254

AUTOMATIC SHUTTER
Manufacturer's automatic shutter is unusually sensitive to air current causing the aluminum louvers to open instantly when fan is turned on and snap shut when fan is turned off. Catalog available.
Page 135 Item 255

LARGE CAPACITY UNIT COOLERS
Designed to deliver full rated capacity these unit coolers reduce number of units required. Efficient and economical, they are designed for operation at all normal temperatures. Information is available.
Page 135 Item 256

BOILER WATER LEVEL CONTROL
Manufacturer believes their boiler water level control to be the safest as well as the simplest device available. Operating life is almost unlimited. Catalog is available.
Page 135 Item 257

FORCED DRAFT COOLING TOWERS
Three sales representatives are listed for this manufacturer of forced draft cooling towers. The name of your nearest representative is available.
Page 135 Item 258

FLEXIBLE DUCT CONNECTOR
Available in handy 25, 50, or 100 ft rolls, the manufacturer's product makes fabrication of any type of flexible duct connector easy. Catalog is available.
Page 136 Item 259

REFRIGERATION VALVES
The company's line of valves designed for refrigeration and other high pressure services feature in-service repacking, tight closure, and large handwheel. Information is available.
Page 137 Item 260

CENTRIFUGAL ROOF EXHAUSTERS
These quiet operating centrifugal roof exhausters are expressly suited for schools, hospitals and public and commercial buildings where sound levels must be held to a minimum. Bulletin is available.
Page 137 Item 261

DUCT FANS
In duct fans as in all types of air moving equipment the company offers a size for every standard industrial application as well as special sizes to order. Bulletin is available.
Page 138 Item 262

MOTEL AIR CONDITIONING
Manufacturer's equipment for motel air conditioning wins praise from president-manager of the new Shreveporter Highway Hotel. Information is available.
Page 139 Item 263

ALARM RELAY
Ad describes hook-up for manufacturer's mercury switch equipped relay for audible or visual alarm system. Bulletin is available.
Page 141 Item 264

GAS UNIT HEATERS
Company's gas unit heaters offer attractive styling, sturdy construction and unbeatable performance. Burners, heat exchangers and direct fired tubes assure quick heat and economical service. Bulletin is available.
Page 143 Item 265

COOLING TOWERS
Company's cooling towers are installed at Caterpillar Tractor plant to keep heat treating processes under cool control. Two bulletins on cooling tower line are available.
Page 144 Item 266

PRESSURE SEALED DRIERS
To obtain maximum drying efficiency this company provides positive indication, by pressure sealing, that the drier is tight, dry, and factory fresh on reaching the user. Information is available.
Inside Back Cover Item 267

PRESSURE RELIEF VALVES
Manufacturer states advantages of ASME Code specifying Btu-rated pressure relief valves as opposed to past ten days when relief valves were fitted by pipe sizes. Company's line has wide range of Btu per hr capacity. Information is available.
Back Cover Item 268

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BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE

NEW!

Henry Abso-Dry®

Pressure Sealed Driers

U. S. Patent No. 2283989

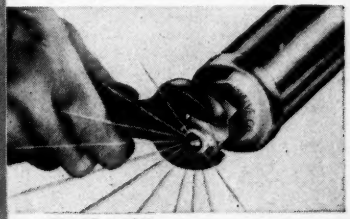
Only a HENRY DRIER proves its dryness with a Hiss©

To obtain maximum drying efficiency, Henry thoroughly reactivates each drier and, by an exclusive, patented process of manufacture, provides positive indication, by pressure sealing, that the drier is tight, dry, and factory-fresh on reaching the user.

Complete Size Range—*The complete range of types, capacities, and connection sizes permits the selection of the proper Henry drier for any installation.*

STOCKED AND SOLD BY LEADING JOBBERS.

*"They Hiss and Tell"**



***TRADE-MARK**

When the end connection seal of a new Henry drier is loosened prior to installation, there is a hissing sound due to the escape of dehydrated air.

HENRY VALVE CO.

MELROSE PARK, ILLINOIS (Chicago Suburb)

Cable: Hevalco, Melrose Park, Illinois

VALVES, DRIERS, STRAINERS, AND ACCESSORIES FOR REFRIGERATION, AIR CONDITIONING AND INDUSTRIAL APPLICATIONS

LISTED BY UNDERWRITERS' LABORATORIES, INC. UNDER RE-EXAMINATION SERVICE FOR WORKING PRESSURES OF 350 P.S.I. AND 500 P.S.I.

"You can't be safe by accident"

In the old days, when relief valves went by pipe sizes instead of discharge capacity, you might "accidentally" get a relief valve adequate for the job — particularly if you had an "open system."

But with the increase in the use of closed systems—and to prevent real accidents resulting in damaged boilers—the casualty companies, National Board, and others went to work . . . hence the present ASME Code calling for Btu.-rated relief valves.

It is no "accident" that McDonnell Relief Valves offer the maximum safeguard against over-pressure for hot water space heating boilers, hot water tanks, and heaters. They were the first Btu.-rated valves . . . and they are still first in design, workmanship, quality, and on-the-job dependability.

In the McDonnell 230 series you have a relief valve for practically every job. Note the range of capacities and sizes listed below.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

The accompanying table tells the story. For hot water space heating boilers the precision-built, dependable McDonnell 230 Series has been expanded to cover the large boilers as well as the small ones. In addition to the ¾" valve, the series now includes 1" and 1½" sizes for larger boilers. For still larger boilers there are the manifold assemblies—dual valves with a common inlet. These offer the very real advantage of *keeping discharge in step with actual need* . . . a smaller valve, opening at 30 lbs., to take care of thermal expansion and a big valve, set at a slightly higher pressure, ready for any emergency.

For use on hot water tanks and heaters, McDonnell 230 Series Valves are available with standard opening pressures as listed and manifold assemblies are also available for large jobs.

All of these valves are designed and built to ASME requirements and have been tested, Btu.-rated, and certified by the National Board of Boiler and Pressure Vessel Inspectors.

Your Jobber Stocks Them

For Hot Water Space Heating Boilers

McDonnell Valve No.	Boiler Size Btu./hr. ASME	Inlet (Internal)	Outlet (Internal)	Opening Pressure
230-¾ IN.-30	303,000	¾"	¾"	30 lbs.
240-¾ IN.-30	513,000	¾"	1"	30 lbs.
230-1 IN.-30	743,000	1"	1"	30 lbs.
240-1 IN.-30	910,000	1"	1¼"	30 lbs.
230-1½ IN.-30	1,025,100	1½"	1½"	30 lbs.
230-M-1	1,488,000	2"	¾" 1½"	30 lbs. 36 lbs.
240-M-1	1,698,000	2"	1" 1½"	30 lbs. 36 lbs.
230-M-2	1,928,400	2"	1" 1½"	30 lbs. 36 lbs.

For Hot Water Tanks and Heaters

McDonnell Valve No.	Opening Pressure	Capacity Btu./hr. ASME	Inlet (Internal)	Outlet (Internal)
230-¾ IN.-75	75 lbs.	502,000	¾"	¾"
230-¾ IN.-100	100 lbs.	640,000	¾"	¾"
230-¾ IN.-125	125 lbs.	783,000	¾"	¾"
230-¾ IN.-150	150 lbs.	925,000	¾"	¾"
240-1 IN.-75	75 lbs.	1,260,000	1"	1¼"
240-1 IN.-100	100 lbs.	1,610,000	1"	1¼"
240-1 IN.-125	125 lbs.	1,960,000	1"	1¼"
240-1 IN.-150	150 lbs.	2,320,000	1"	1¼"

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0 lbs.	¾"
0 lbs.	1 ¼"
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6 lbs.	1 ¼"
0 lbs.	1 ¼"
6 lbs.	
0 lbs.	
6 lbs.	